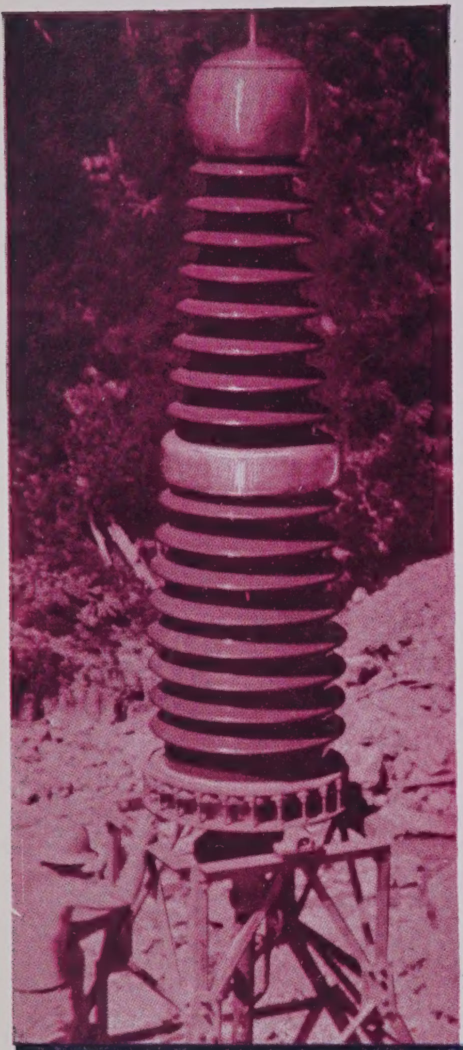
BOURNEMOUTH CONVENTION GUIDE

ELECTRICAL REVIEW

FRIDAY
27 MAY 1960

WEEKLY
PRICE 1s 6d

JUN 14 1960



In the Snowy Mountains region of Australia, a great river, the Snowy, and its tributary, the Eucumbene, are being diverted from an easterly course to irrigate the western plains of New South Wales and Victoria. On its journey westward this water will fall more than 2,000 ft.—a staggering power potential which, through a chain of hydro electric power stations, will eventually produce enough electricity to pay for the whole vast enterprise. For one of the first of these power stations, the T.1. on the River Tumut, a tributary of the Eucumbene, Pirelli-General have manufactured and installed the highest voltage oil-filled cables ever made in this country. Transmission of power at 330 kV. 3 phase 194 M.V.A. (340 amperes phase) along a tunnelled route from an underground generating station to an outdoor switchyard some 1,600 ft. distant *on the other side of the River Tumut*

AUSTRALIAN SNOWY MOUNTAINS HYDRO-ELECTRIC AUTHORITY

FIRST with 330 kV OIL-FILLED CABLES

proved a formidable undertaking, and the seven cables, all of which were installed in single lengths of 1,625 ft. without intermediate joints, were carried on the bridge shown in the photograph. Pirelli-General are proud to announce that their contract to provide a vital link in this great Commonwealth enterprise has now been completed.

PIRELLI-GENERAL
CABLE WORKS LTD · SOUTHAMPTON

Heatrae *of Norwich*

present

The most up-to-date AUTOMATIC ELECTRIC WATER HEATER

Only 10″ wide, yet delivering up to 9 gallons of hot water per hour.

The Heatrae "Express" marks a big jump forward in Electric Water Heater design.

The economy eye glows when the current is on and is extinguished when the correct temperature is reached.

The special dispenser outlet ensures smooth even flow and instant cut-off when closing the valve.

Available in loadings of 3 kW. or 2 kW. at 230/250 volts, or 200/220 volts, A.C. only.

Finished cream or white.
Price: £10.12.6 plus P. Tax: £2.1.5.

Full details on Leaflet No. 92 sent on request.

EXCLUSIVE ECONOMY EYE

SPECIAL DISPENSER OUTLET CONTROL

Heatrae *Lido* 'Express'

*
9

GALLONS of PIPING HOT WATER per hour—every hour!

Manufacturers of Electric Water Heaters, Oil Heaters, Immersion Heaters, Urns, Towel Rails, Airing Cupboard Heaters, Electric Fires, Flameproof Heating Apparatus, Food Trolleys, Warming Plates, Air Heaters. Specialists in Steam Heated Oil Heaters and Calorifiers for Shipboard.

HEATRAE LIMITED

Pioneers since 1920 in all-electric water heaters

NORWICH - NORFOLK NOR 29 A - ENGLAND
Telegrams: HEATRAE • NORWICH Telephone: NORWICH 25131 (Private Exchange)

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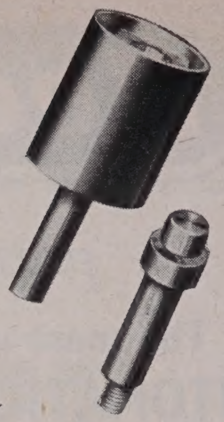


Repetition Work

Ormond can cope whatever the need. Quality is assured by the name, and manufacturing resources are second to none. An unrivalled reputation for service takes care of prompt delivery. Please ask us to quote. Any quantity.

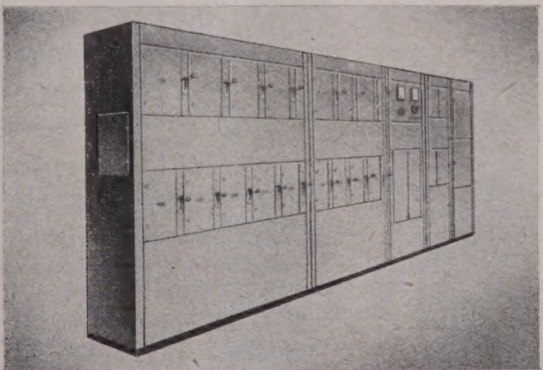
The Repetition Parts range covers single and multi spindle automatics up to 1¼" dia., Brass, Steel and Light Alloy Screws in Rolled and Cut Threads, Grubscrews, Nuts, Allthreads, Hexagon Bolts and Setscrews turned from bar and Cold Headed Grades "A", "B", and High Tensile.

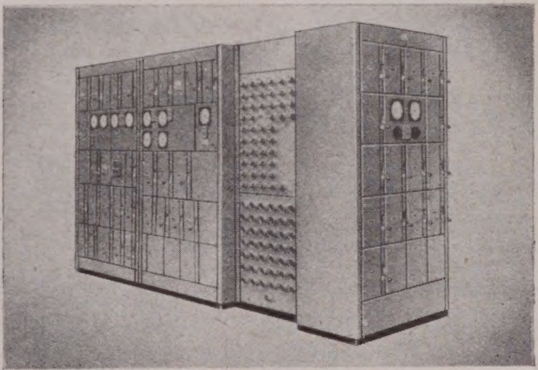
THE ORMOND ENGINEERING CO., LTD.
Ormond House, Rosebery Avenue, London, E.C.1
Telephone: TERminus 2888
Telegrams: "Ormondengi, Smith"

The ORMOND Engineering Co. Ltd.

You cannot buy better gear

The Modern Switchgear – for Modern Buildings





MAJESTIC MEDIUM VOLTAGE SWITCHBOARDS ARE BEING SPECIFIED WITH EVERY CONFIDENCE BY LEADING ARCHITECTS, CONSULTING ENGINEERS, ELECTRICITY BOARDS AND INSTALLATION ENGINEERS FOR MODERN TECHNICAL COLLEGES, HOSPITALS, CIVIC AND INDUSTRIAL BUILDINGS.

★ WRITE FOR A COPY OF OUR LATEST BROCHURE MVS.460.

BILL SWITCHGEAR LTD
BIRMINGHAM·20

LONDON, S.W.1 A. W. ZELLEY, N. PAYNE, R. W. HANKINSON GILLINGHAM ST.
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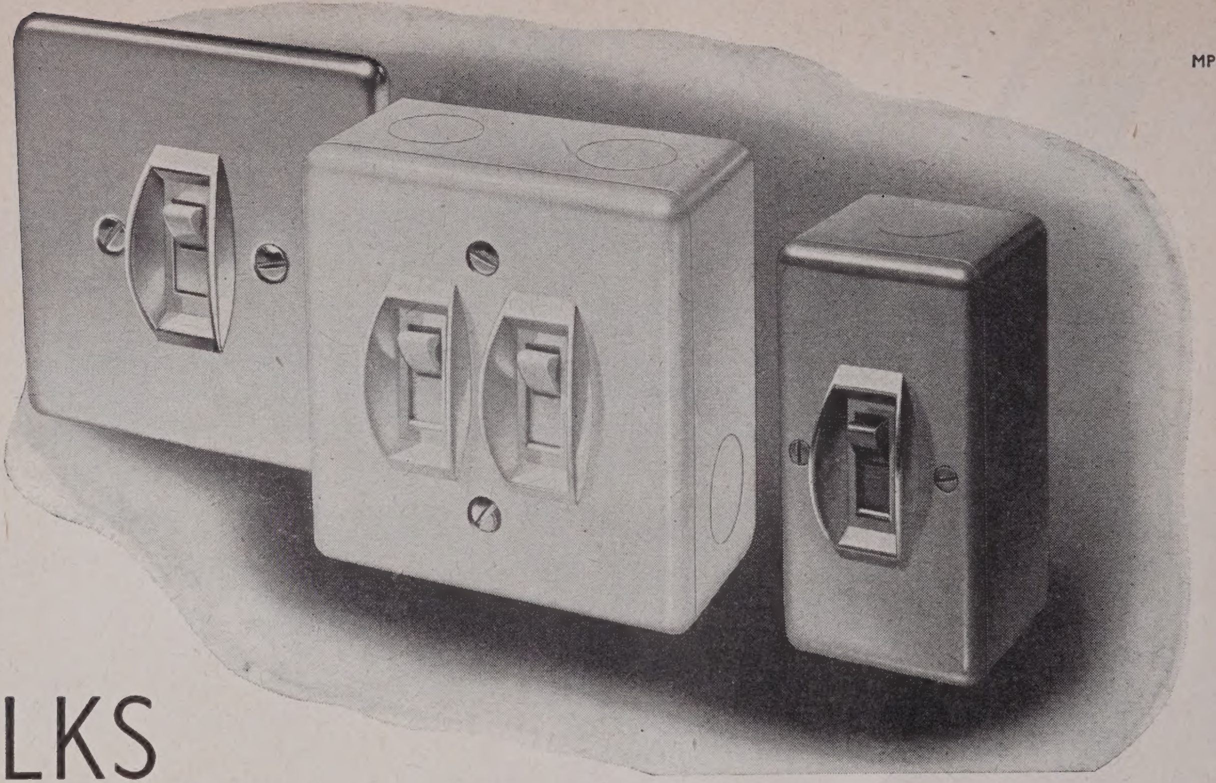
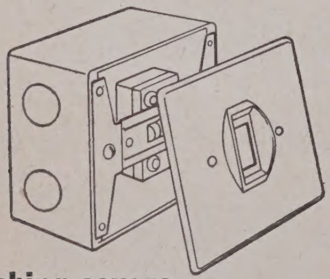

MPI

FALKS

new **METALCAST** switches *for use in offices, hospitals, schools, etc.*

Special features include:

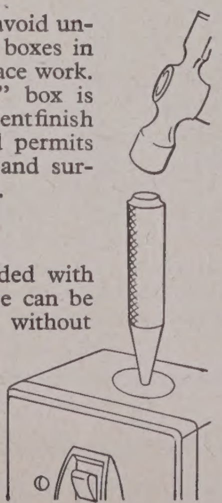


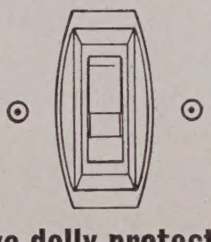
Matching covers and boxes

It is possible to avoid unsightly cast iron boxes in commercial surface work. The "Metalcast" box is of the same excellent finish as the plate and permits matching flush and surface installations.

Knockouts

Boxes are provided with knockouts. These can be removed cleanly without spoiling the finish. They thus obviate difficult drilling or bench work on site.



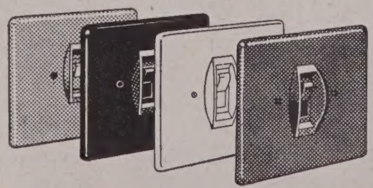


Effective dolly protection

The dolly cannot be damaged owing to the raised side protectors which also add distinction to the design.

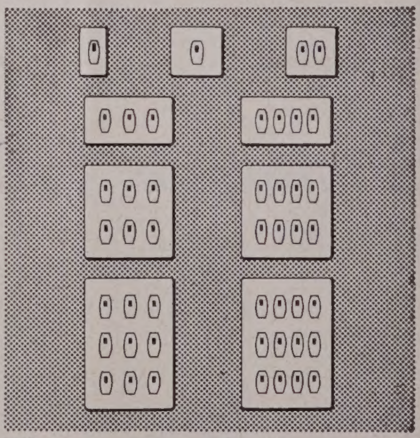
Secret fixing

Where required for schools and institutions all models can be supplied with plate fixing by miniature Allen screws.



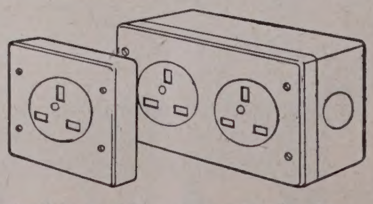
Choice of finishes

The complete Metalcast range is available in Florentine Bronze Plated Finish, Bronze Enamel, Silvercote Enamel or White Enamel. The enamels are based on an epikote resin to give great surface hardness and a resistance to acids and alkalis.



Widest range of all

See diagram—This applies to both flush and surface fixings.

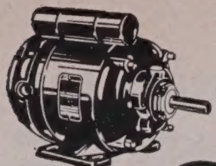


Matching 13 amp sockets

In finishes as above, single and double units, unswitched, the single unit also being available switched.

FALK STADELMANN & CO. LTD., 91 Farringdon Rd., London, E.C.1. HOL 7654.
Showrooms at: 20/22 Mount St., London, W.1. MAY 5671 *and branches.*

FALKS



THEY ALL CHOSE AEI FRACTIONALS

... I wanted a totally enclosed fan-cooled motor
I wanted a two-pole motor ...
... I wanted a split-phase 'fractional' with flanged endshield

Whatever the project, if you are producing machinery to be powered by a.c. or d.c. motors of up to one h.p., consult AEI engineers at the design stage. The wide choice of fractionals they can offer gives you greater scope for producing machinery of improved design and performance. AEI experts have almost certainly met problems similar to yours already, and their valuable experience and knowledge are at your service.

OUR ADVISORY SERVICE FOR DESIGNERS

will save you time and trouble!

Consult AEI engineers *at an early stage* and make sure of getting the *right* f.h.p. motor for the job! Many types and sizes from 1/500 h.p. are available, with every conceivable kind of mounting or fitting, and many of these are available from stock. You can thus combine maximum efficiency and reliability with the most compact, practical, and attractive design.

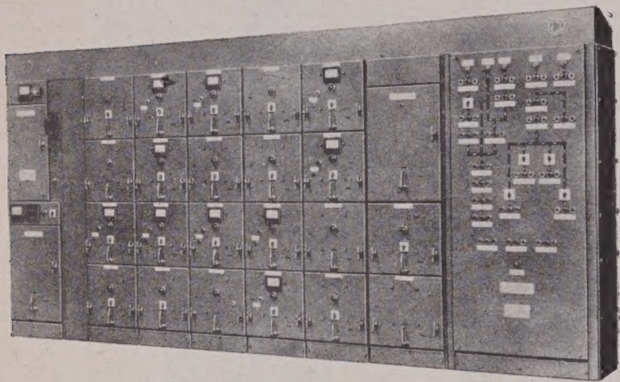
AEI

Associated Electrical Industries Limited
Motor and Control Gear Division
F.H.P. MACHINES SALES
NEWCASTLE, STAFFORDSHIRE, ENGLAND

BTH *INCORPORATING THE MOTOR AND CONTROL GEAR INTERESTS OF BTH AND M-V*

A 5393

SPECIFY WECDL CONTROL GEAR & SWITCHGEAR FOR MEDIUM VOLTAGE INSTALLATIONS

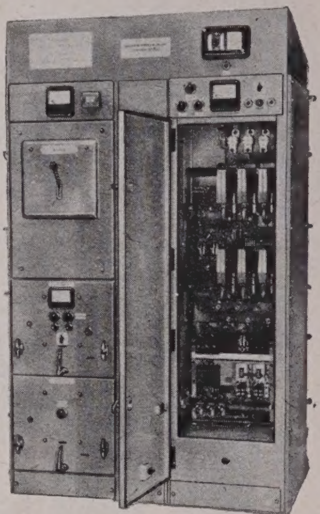


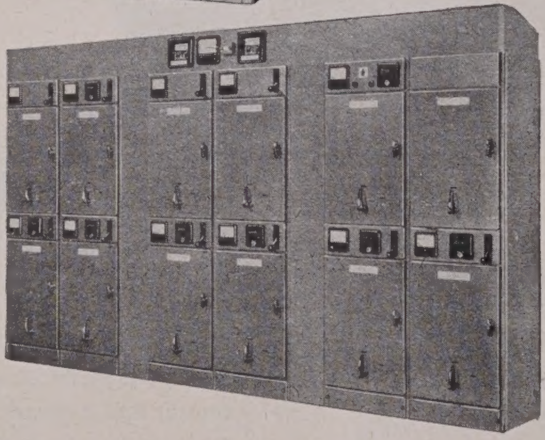
MOTOR STARTER BOARD & CONTROL PANEL

Typical of Starter Boards for use in material handling plants where machines require to be started in sequence by semi-skilled operators.

WAGON TIPPLER CONTROL BOARD

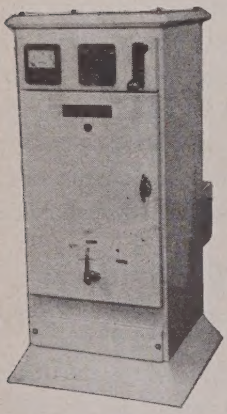
Tipplers and similar machines requiring reversal are frequently controlled automatically or semi-automatically. This Unit is for semi-auto operation of a 60 H.P. Tippler with Thruster Control built into the main Starter.





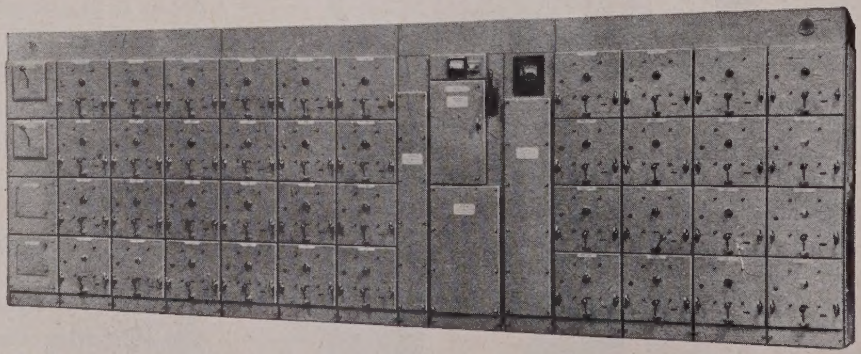
CIRCUIT BREAKER DISTRIBUTION SWITCHBOARD

Medium voltage Circuit Breakers required for distribution are available in Two Tier formation as shown, up to 300 amps. Earth Leakage and other features may be incorporated.



DISTRIBUTION PILLAR UNIT

Type D.59 Circuit Breaker Units are available as shown, together with a range of Motor Starters. These Units can also be supplied in Switchboard formation.

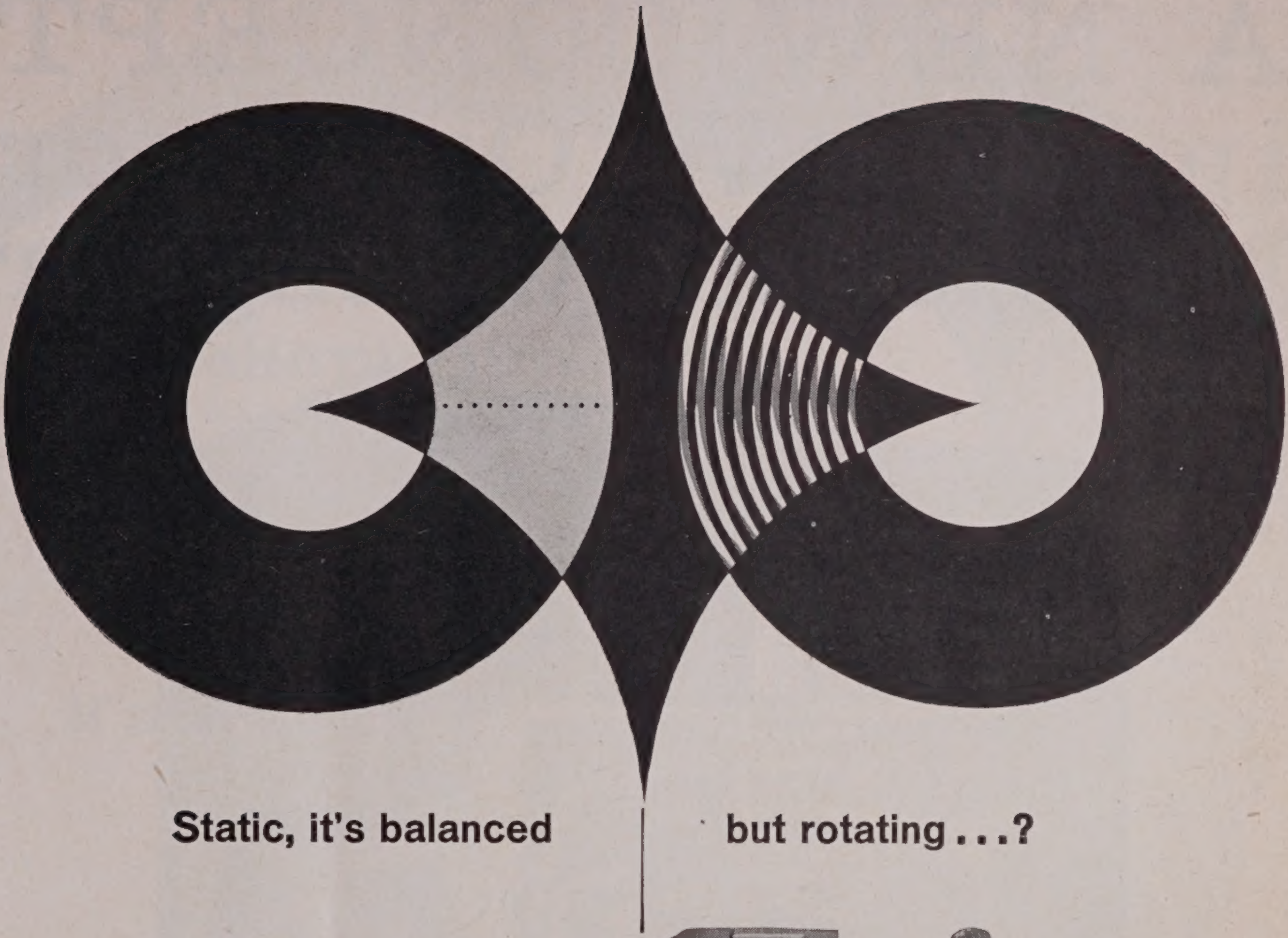


MOTOR STARTER CONTROL BOARD

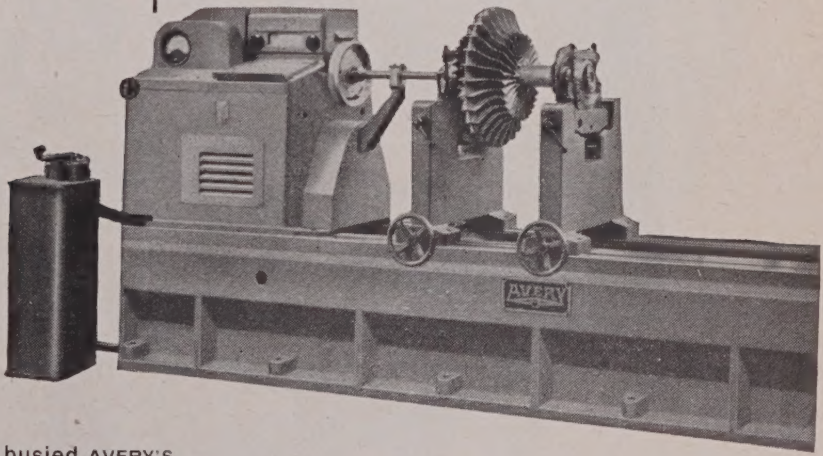
Chemical processes etc. requiring control at the apparatus frequently call for Control Gear located away from the plant. This is typical of Units supplied for this purpose.

THE WALLACETOWN ENGINEERING CO. LTD.
VIEWFIELD ROAD AYR, SCOTLAND
TELEPHONE AYR 64618-9 'GRAMS "WALENCO. AYR"

CARDIFF NEWCASTLE-ON-TYNE SHEFFIELD MANCHESTER



Static, it's balanced | **but rotating . . . ?**



Two very different stories. You *cannot* detect dynamic out-of-balance in a static workpiece. Set it spinning, oscillation begins, centrifugal forces soon exceed the dead weight of the rotor . . . result: inefficiency, even fatigue failure, or damage to buildings if the rotor is a big one.

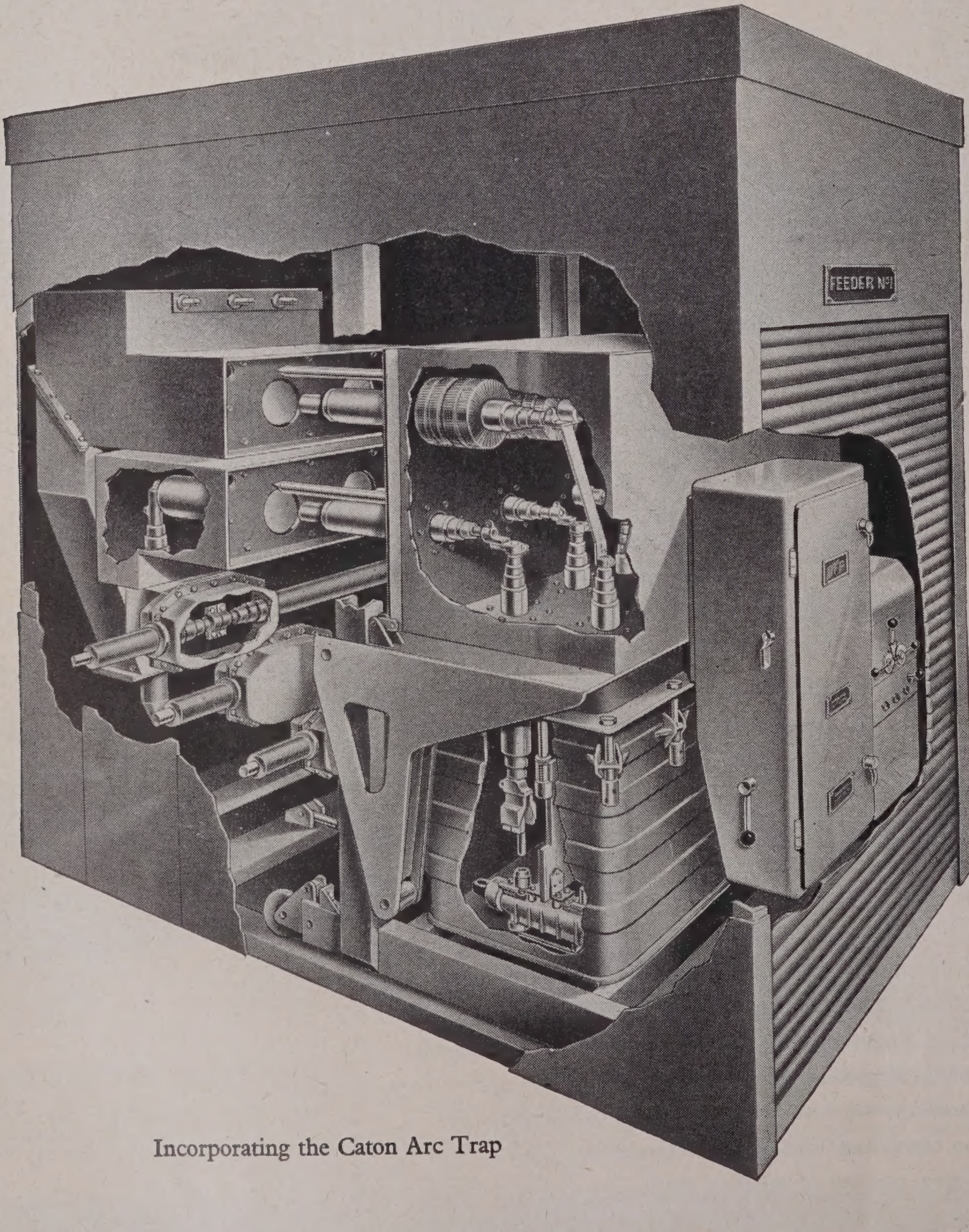
Detecting and measuring out-of-balance has busied AVERY'S Technical Department for a long time. It's produced machines like the one shown. Rapid, direct electrical indication of unbalance amount and position is given by means of the Wattmeter system – far more sensitive than most normal commercial usage requires. Readings can be converted, into units of correction (depth of drill holes, number of weights, etc.).

Send for illustrated booklet, to the address below, quoting reference ER 1

AVERY for **ELECTRODYNAMIC BALANCING**

W. & T. Avery, Limited, Birmingham.

A NEW CONCEPT in 33kV Out-door Metalclad Switchgear



Incorporating the Caton Arc Trap

YORKSHIRE SWITCHGEAR & ENGINEERING CO. LTD.
YOUR SYMBOL FOR RELIABILITY

MEANWOOD, LEEDS 6, ENGLAND Tel.: LEEDS 57121/5

Yorkshire Switchgear are experienced in engineering whole projects from the electrical aspect and welcome initial enquiries

It's aluminium

Sheathed in *seamless* extruded aluminium, this cable is lightweight yet strong. It needs no armouring, thus allowing simple cable design. With a high resistance to vibration fatigue, it can be used with complete safety, alongside railways etc.

It's flexible

Corrugation results in greater flexibility, permitting the same bending radius as a lead sheathed cable. Not only are handling qualities improved but corrugation reduces the required thickness of the sheath *by one half*.

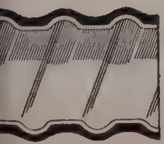
It's a money saver

Initial costs are therefore lower than conventional type cables of similar performance. Lightness and flexibility simplify transportation and installation. No special precautions are necessary to allow for expansion and contraction.

Further information is available on request.

It's the BICC C.S.A. cable

CORRUGATED
SEAMLESS
ALUMINIUM



PROTECTIVE SERVING

Anti-corrosion protection is provided by an extruded P.V.C. covering which fits tightly over the whole sheath surface. *See section view.*

INSTALLATION

Conventional installation procedure is followed. Jointing techniques are the same as for normal smooth aluminium-sheathed cables.

CABLE TYPES

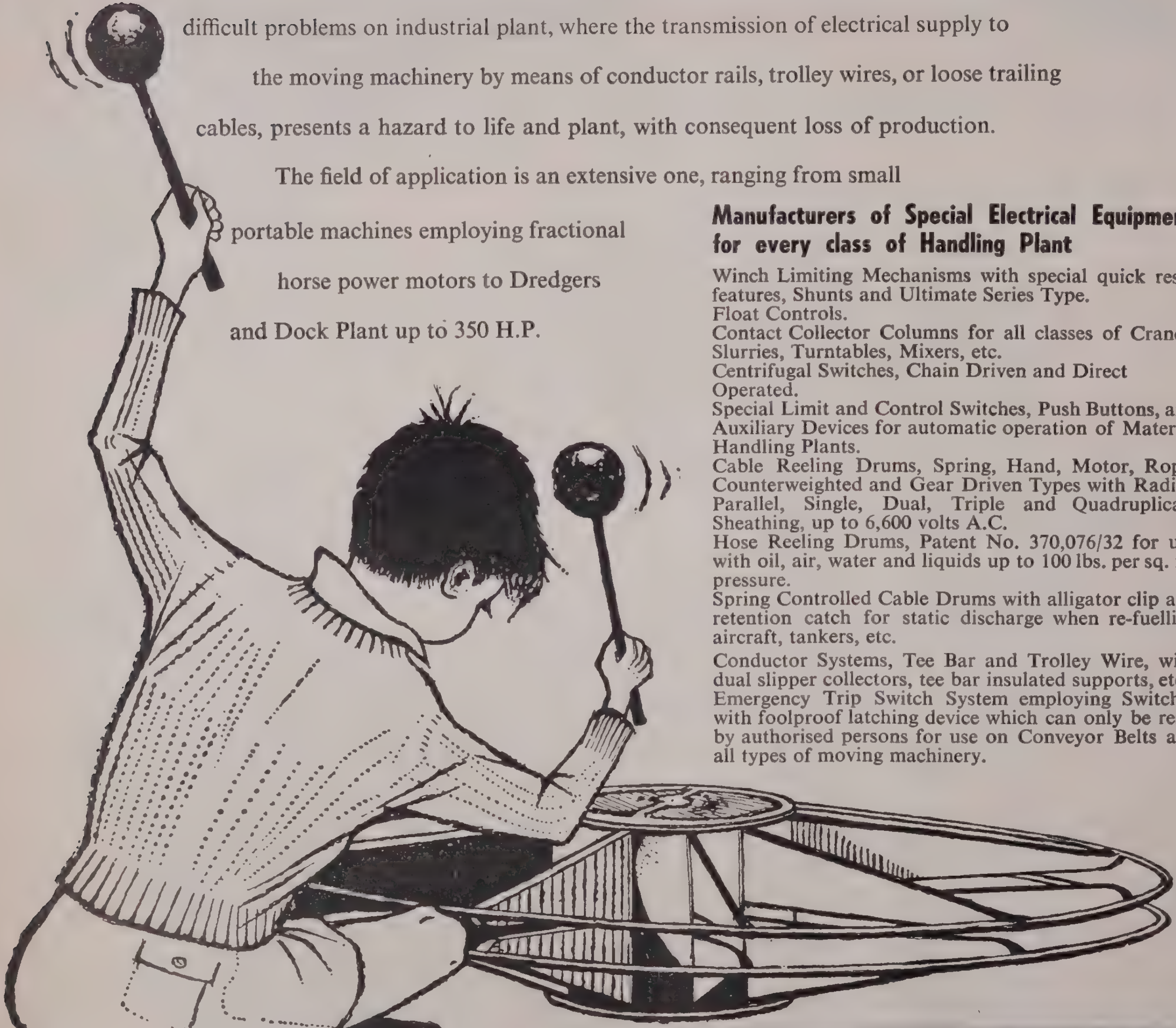
C.S.A. sheathing is available with BICC Mass - Impregnated Non - Draining (M.I.N.D.) Cables up to 33kV and for Oil-Filled Cables.

BRITISH INSULATED CALLENDER'S CABLES LIMITED 21 BLOOMSBURY STREET LONDON W C 1

you can't beat this drum

DECO Cable reeling drums are designed and developed to solve one of the most difficult problems on industrial plant, where the transmission of electrical supply to the moving machinery by means of conductor rails, trolley wires, or loose trailing cables, presents a hazard to life and plant, with consequent loss of production.

The field of application is an extensive one, ranging from small portable machines employing fractional horse power motors to Dredgers and Dock Plant up to 350 H.P.



Manufacturers of Special Electrical Equipment for every class of Handling Plant

Winch Limiting Mechanisms with special quick reset features, Shunts and Ultimate Series Type.
Float Controls.
Contact Collector Columns for all classes of Cranes, Slurries, Turntables, Mixers, etc.
Centrifugal Switches, Chain Driven and Direct Operated.
Special Limit and Control Switches, Push Buttons, and Auxiliary Devices for automatic operation of Material Handling Plants.
Cable Reeling Drums, Spring, Hand, Motor, Rope, Counterweighted and Gear Driven Types with Radial, Parallel, Single, Dual, Triple and Quadruplicate Sheathing, up to 6,600 volts A.C.
Hose Reeling Drums, Patent No. 370,076/32 for use with oil, air, water and liquids up to 100 lbs. per sq. in. pressure.
Spring Controlled Cable Drums with alligator clip and retention catch for static discharge when re-fuelling aircraft, tankers, etc.
Conductor Systems, Tee Bar and Trolley Wire, with dual slipper collectors, tee bar insulated supports, etc.
Emergency Trip Switch System employing Switches with foolproof latching device which can only be reset by authorised persons for use on Conveyor Belts and all types of moving machinery.

An illustration of a counter-weight operated radial reeling drum accommodating 130 feet of 4-core 1.3" overall diameter reinforced trailing cable for a 40-ton Goliath crane. (Photograph by kind permission of Messrs. Stothert & Pitt Ltd.)

ASSOCIATED COMPANY: **GRILL FLOORS LTD** manufacturers of: Grill Floors for Platforms and Mezzanine Floors, Steel Lattice Ladders, Patented Hand Railing, Grills for Coal Screens, Access Ladders with Convex Visible Edge Stairtreads, Window Cleaning Galleries, Trench Gratings, Duckboards, Servo Docks, Vehicle Washes, Scaffold Boards.

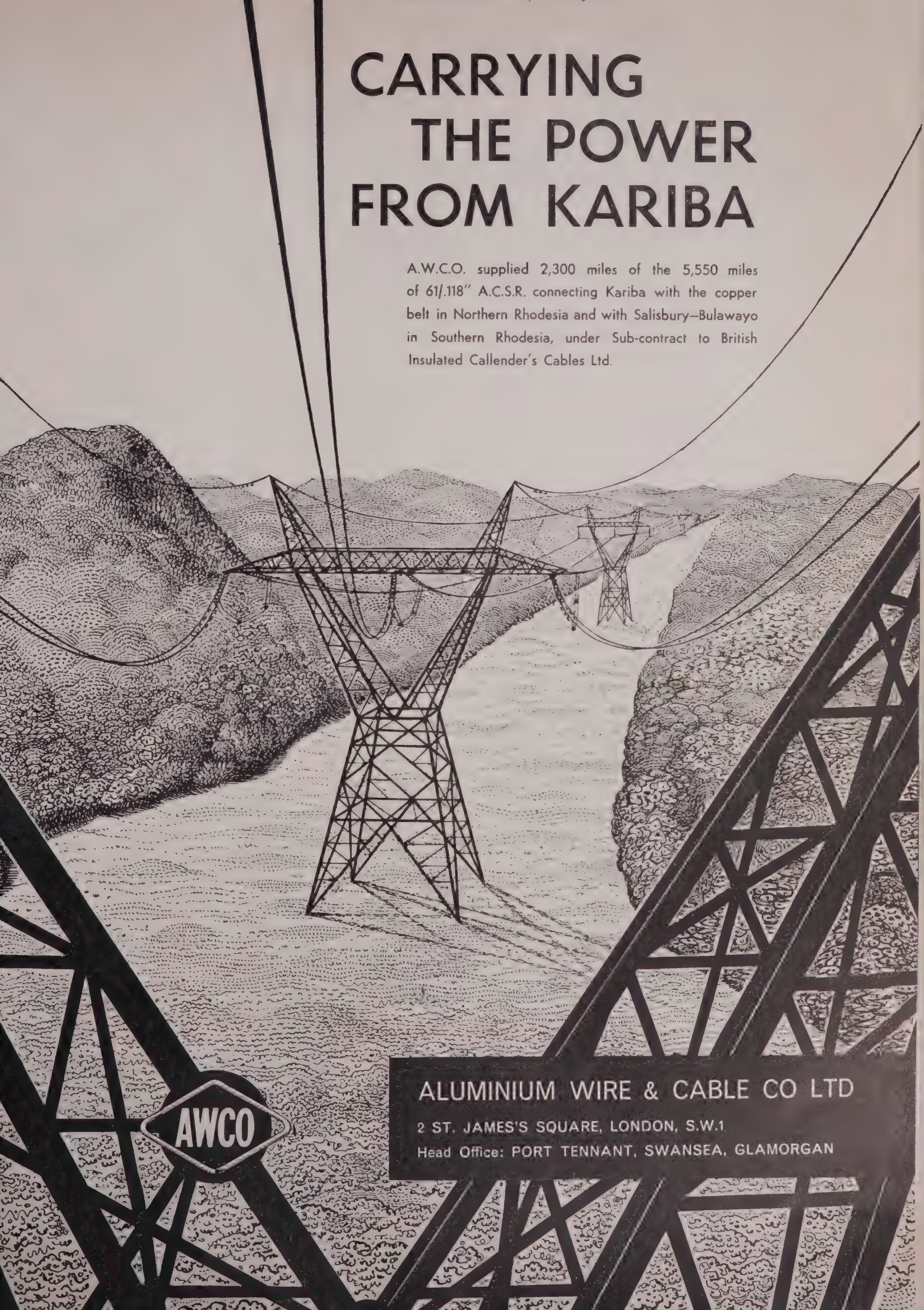
DECO

TRADE DEC MARK
REGD.

cable reeling drums

DECO ENGINEERING CO. LTD., LONDON, W.10 **Tel: Ladbroke 3066/7** **Grams: Etyladec Wesphone London**

P.794



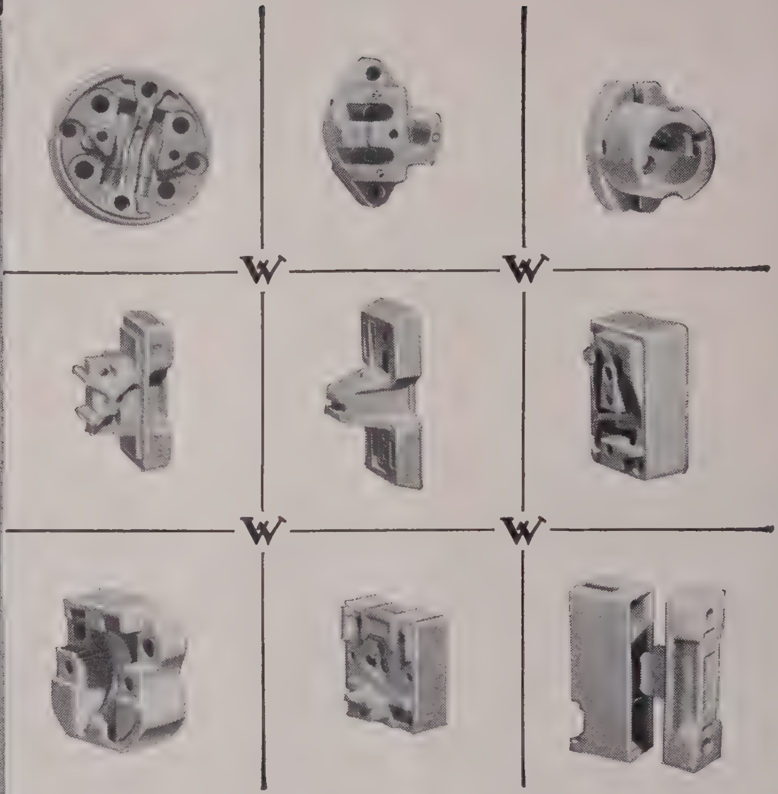
CARRYING THE POWER FROM KARIBA

A.W.C.O. supplied 2,300 miles of the 5,550 miles of 61/.118" A.C.S.R. connecting Kariba with the copper belt in Northern Rhodesia and with Salisbury–Bulawayo in Southern Rhodesia, under Sub-contract to British Insulated Callender's Cables Ltd.

ALUMINIUM WIRE & CABLE CO LTD

2 ST. JAMES'S SQUARE, LONDON, S.W.1
Head Office: PORT TENNANT, SWANSEA, GLAMORGAN

5 x 12 equals 6 x 10 but . . .



. . . nothing equals porcelain for electrical insulation!

That is a fact—a fact which is proved more and more convincingly, as new materials come and go. Wade have specialised in the manufacture of electro-ceramics from the earliest days of electrical development and enjoy an unsurpassed reputation for accuracy, reliability, and fair price.
An enquiry will prove well worth while.

WADE
ELECTRO – CERAMICS

Geo. Wade & Son Ltd., Burslem, Stoke-on-Trent,
Wade (Ulster) Ltd., Portadown, Northern Ireland.

Members of the WADE Group of Potteries

BECMA
BRITISH ELECTRO CERAMIC MANUFACTURERS' ASSOCIATION

It's Porcelain for Insulation . . . It's Wade for Porcelain

132 kV fully insulated high speed resistor on-load tap changers installed on our 120 MVA 275/132 kV Auto-transformer at C.E.G.B. Northfleet Super-grid Sub-station.

consult-

FULLER ELECTRIC

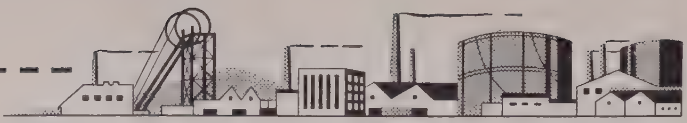
A member of the Hawker Siddeley Group

Sole U.K. representatives for ASEA Sweden
FULLER ELECTRIC LIMITED
FULBOURNE ROAD · LONDON E.17
Telephone: LARkswood 2350

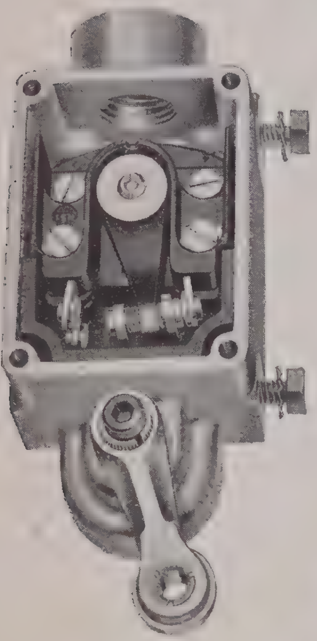
Also at Birmingham, Glasgow and Manchester

ON-LOAD TAP CHANGERS
For every application

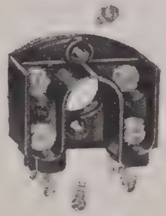
We have designed and constructed On-load tap changing equipment for the widest range of applications. We have supplied equipments on our own transformers and to other transformer manufacturers for over thirty years. Our confidence in our tap changers is such that we guarantee a contact life of at least two hundred thousand operations – approximately twenty years' service.

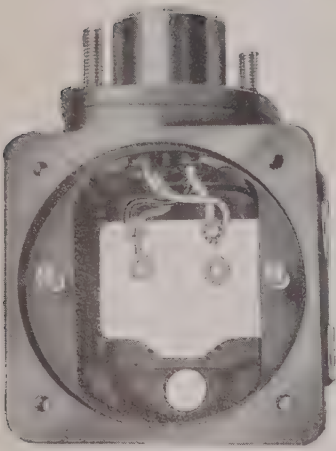


A STYLE APPLICABLE TO EVERY INDUSTRY

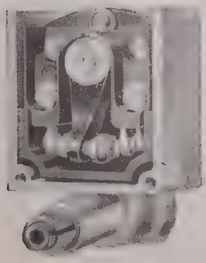


Two only replaceable assemblies in the electrical side: moulded one-piece contact block and arm. Interchangeable on all Mark II versions.





The mechanism of the Flameproof switch is easily removable as a unit for servicing.



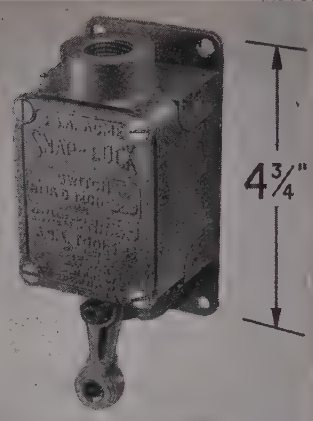
Catalogue of switches and levers on request

Water Oil and Dustproof or Flameproof versions

Standard Neutral position or Centre connection

MARK II

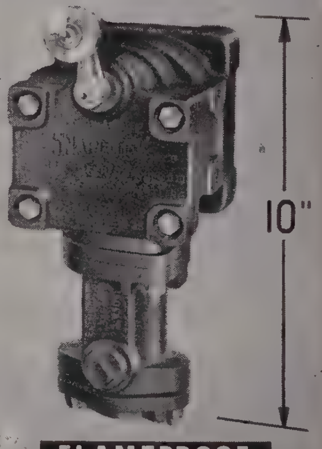
B.S.A. SNAP-LOCK ACME



STANDARD

WATER, OIL & DUSTPROOF

Single pole, double break, double throw, operates with either circuit normally open with other closed, or maintaining in either position, or available with central (neutral) position and/or centre connection. Heavy aluminium die-cast case. Conduit ¾" B.S., or No. 3 Admiralty Pattern Cable gland entry. Two-screw side mounting or backplate mounting in two styles, or Tandem style (back to back mounting). Operating lever position adjustable in 7.5 deg. increments through 82.5 deg. either way from normal.



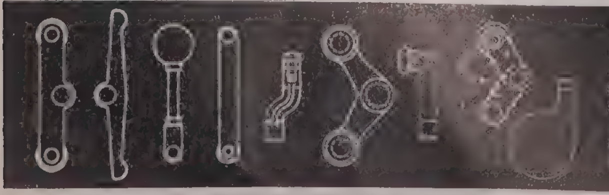
FLAMEPROOF

SINGLE OR DOUBLE ENTRY

Buxton certificates No. 3574 (Group I) No. 3575 (Groups II and III gases). Meehanite iron castings. Self wiping solid silver contacts, interchangeable plugs and sockets. ***Single SWA cable entry (standard); double entry if required.*** *Operating lever position adjustable in 7.5 deg. increments through 360 degs. Single pole, double break, having one normally closed and one normally open circuit. Available with central (neutral) position and/or centre connection.*

HEAVY DUTY LIMIT SWITCHES

471



A few examples from the range of more than 40 styles (over 150 sizes) of interchangeable operating levers. List on request.

Made in England under Licence by
B.S.A. SMALL TOOLS LTD., BIRMINGHAM, 11

TRADE MARKS
B·S·A TOOLS DIVISION

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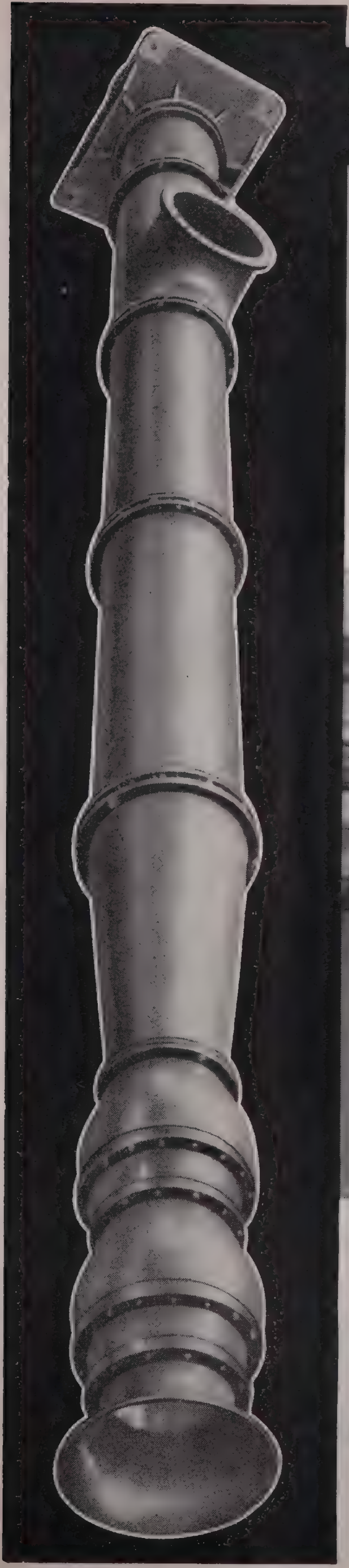

SULZER

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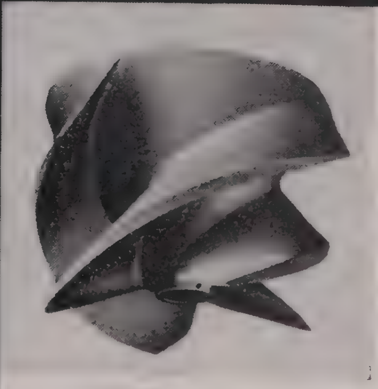

Fig. 1 shows Impeller of a Sulzer Cooling Water Pump type BPS.

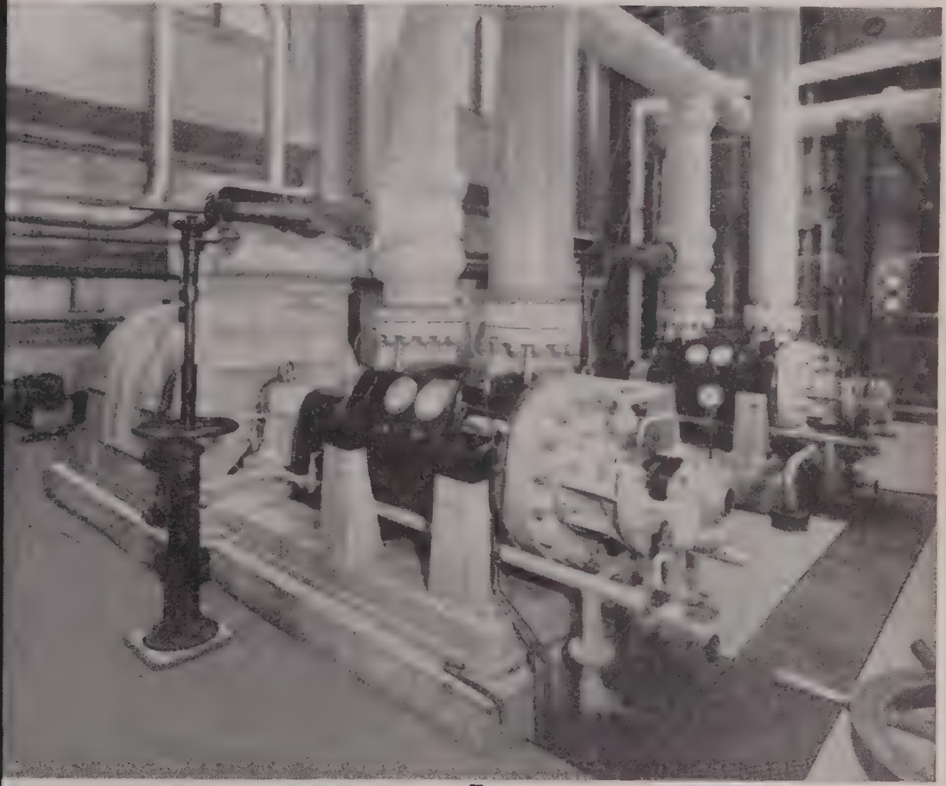

Fig. 2 shows a vertical Pump type BPS intended for handling Cooling Water in Power Stations.

Fig. 3 shows Boiler Feed Pumps installed in Ince Power Station.

Present contracts include Boiler Feed Pumps up to 8,000 BHP.

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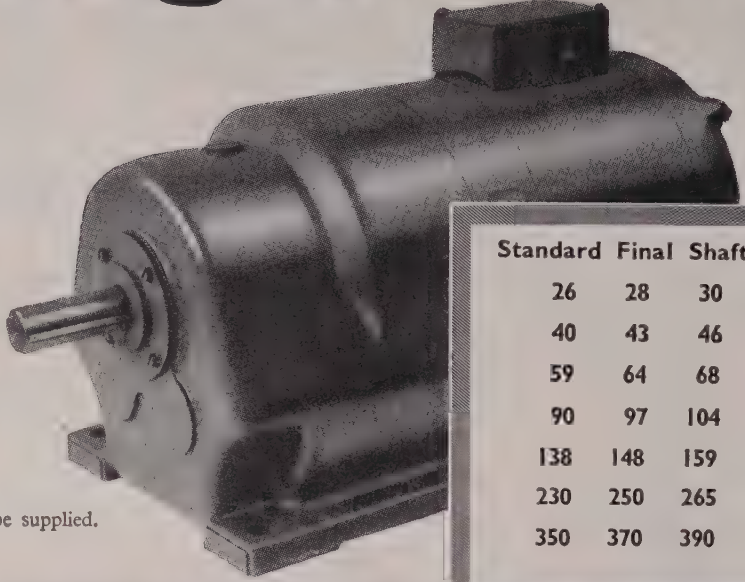
Type DS geared motors



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90	97	104	112	120	128
138	148	159	170	200	215
230	250	265	280	300	325
350	370	390	415	450	475

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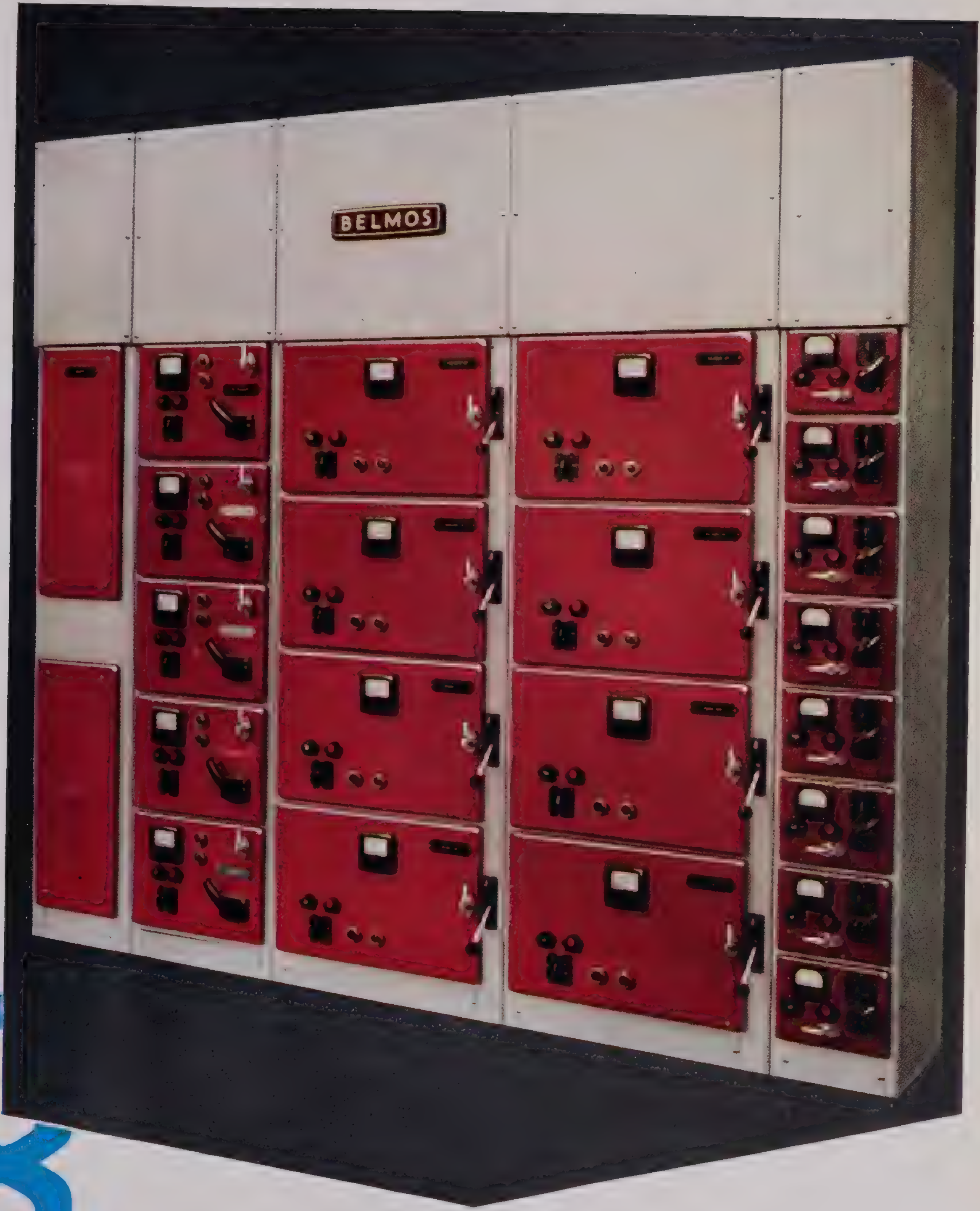
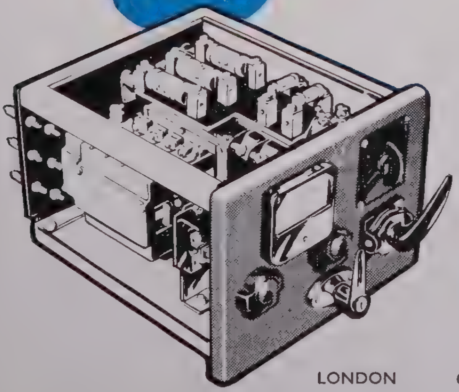


8-tier for small motor starting



The Belmos 'H' range eight-tier cubicle can accommodate eight direct-on-line starters suitable for the control of squirrel-cage motors up to 7½ h.p. at 440 volts. Each starter is fitted with a load-breaking isolating switch and is housed in a plug-in chassis for accessibility and speed of servicing. This unit is fully described in leaflet K 500 which will be sent on request.

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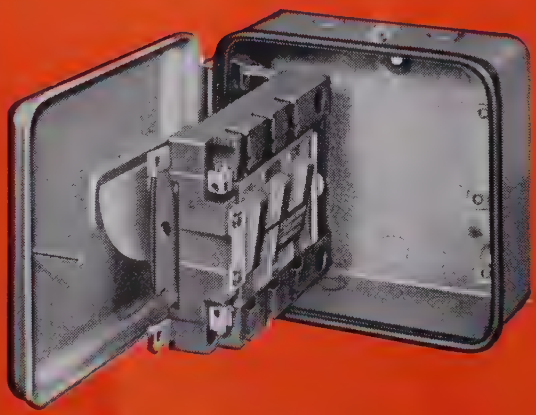

Star Switchfuse with cover open showing interior hing forward for ease of wiring

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★ Unique ease of wiring facilities.

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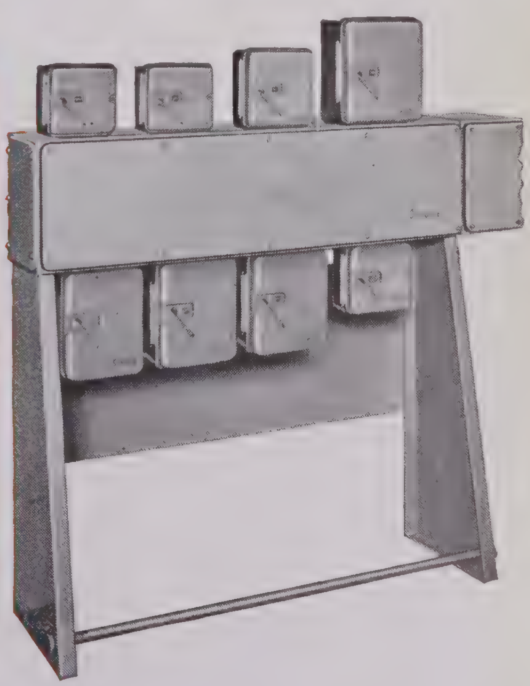

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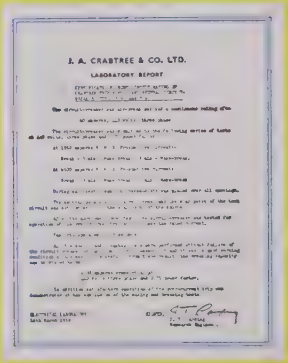

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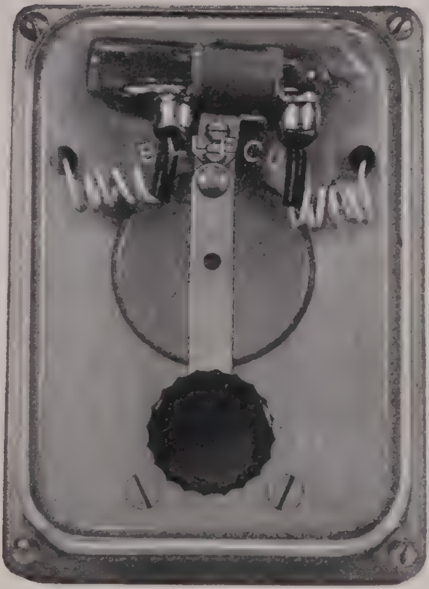

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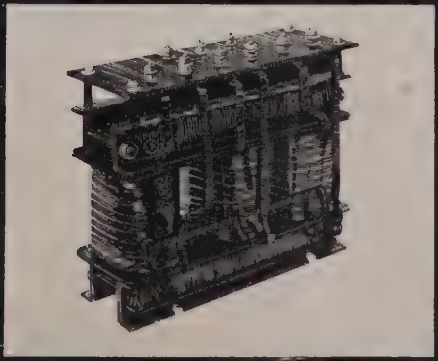

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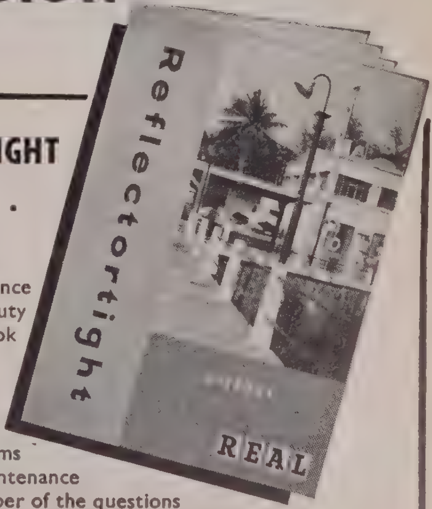

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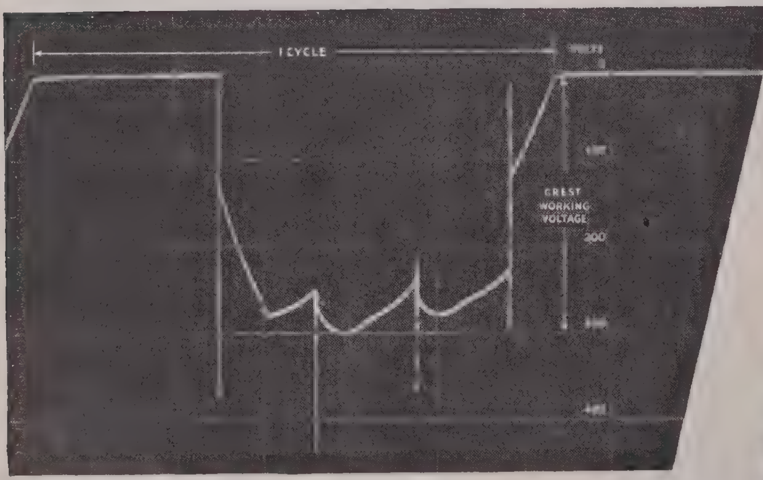

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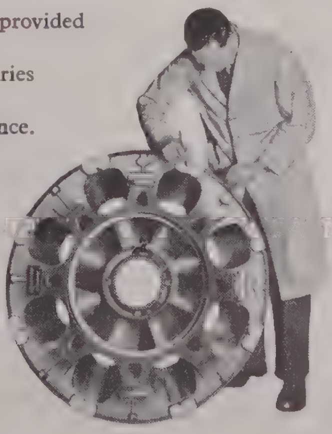

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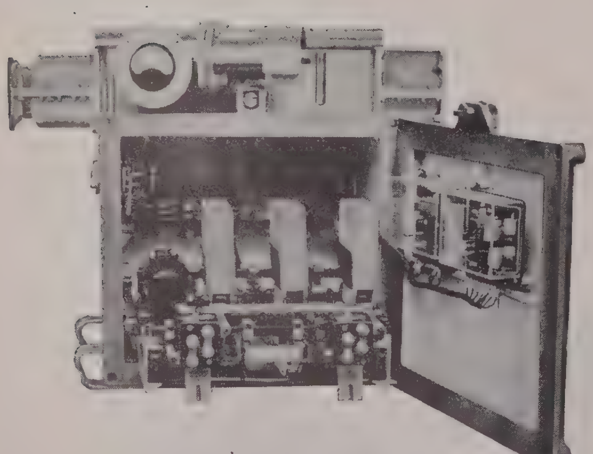

A 660 volts 150 amp 7.5 MVA Gate-End Box with interior partly withdrawn to show Arc Chutes of "SINDANYO" Asbestos Electric Arc and Heat Resisting Board, Silicone Resin Impregnated, Symbol No. CS.86.

By courtesy of W. & H. Nelson Limited, Mossend, Lanarkshire

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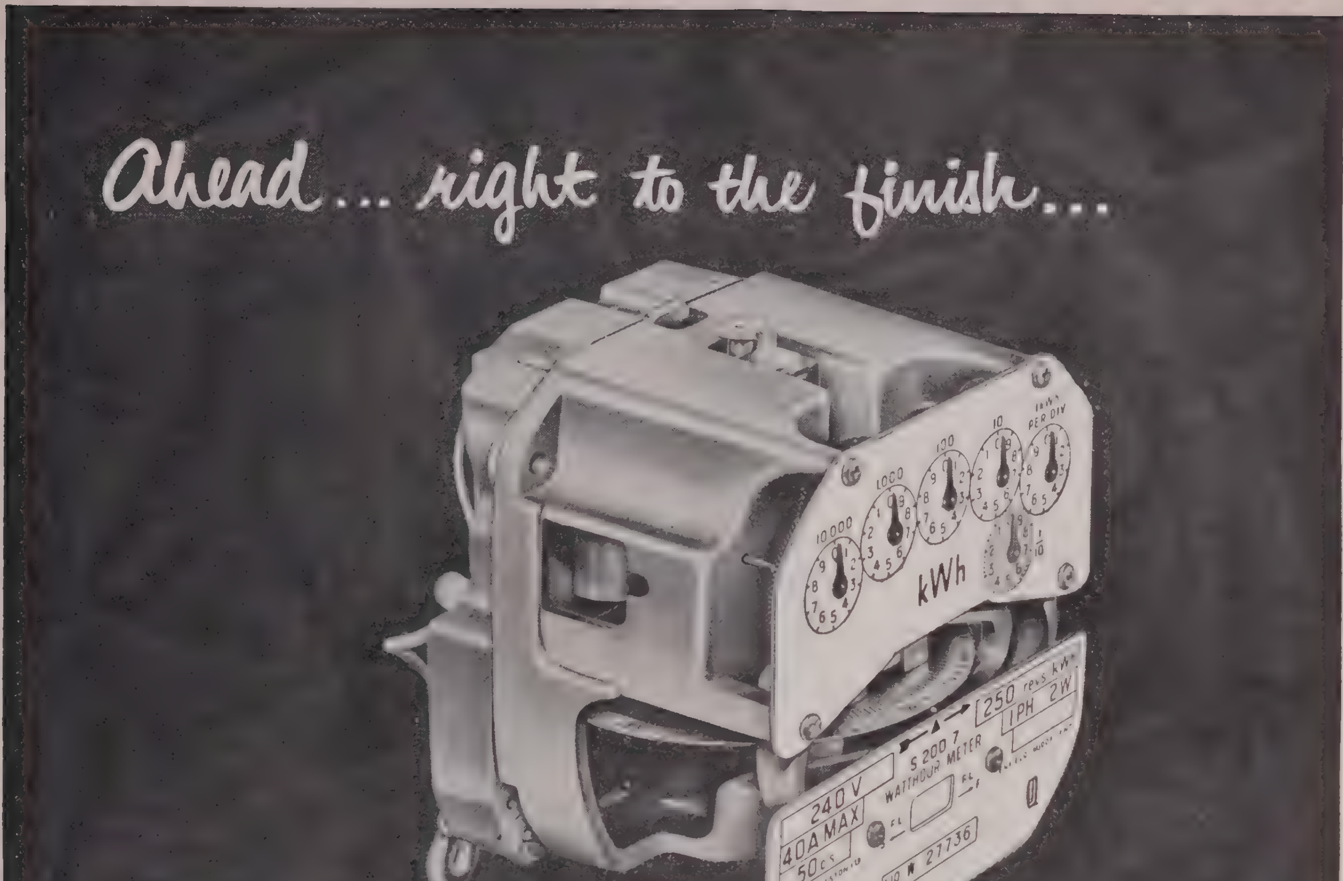

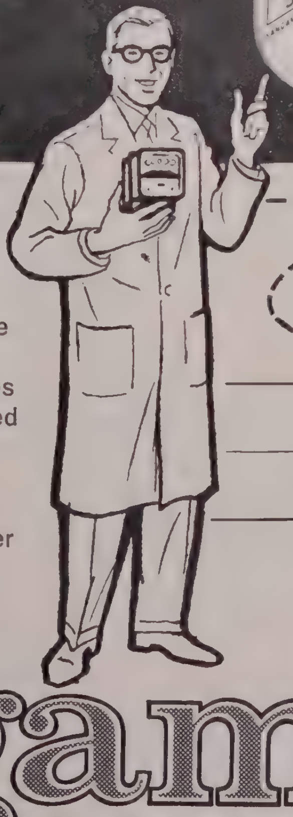

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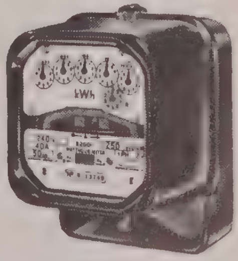

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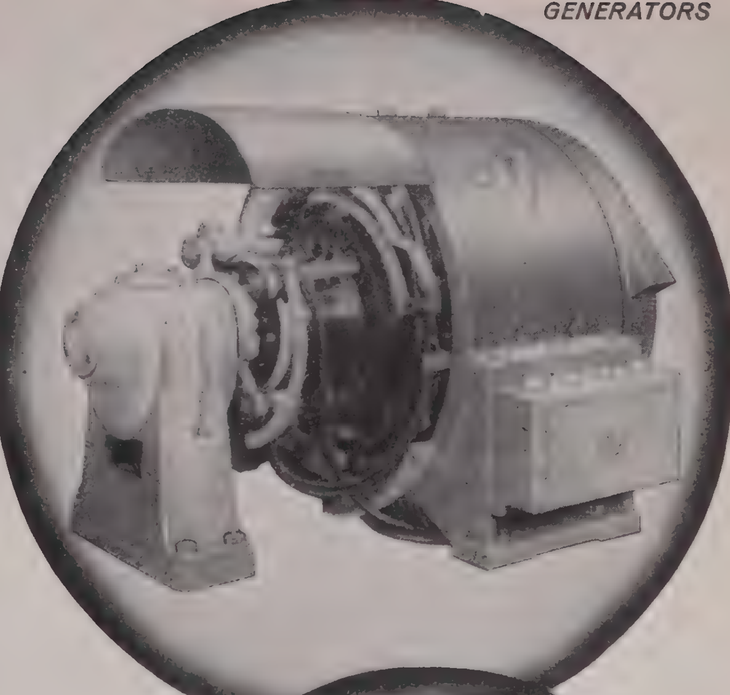

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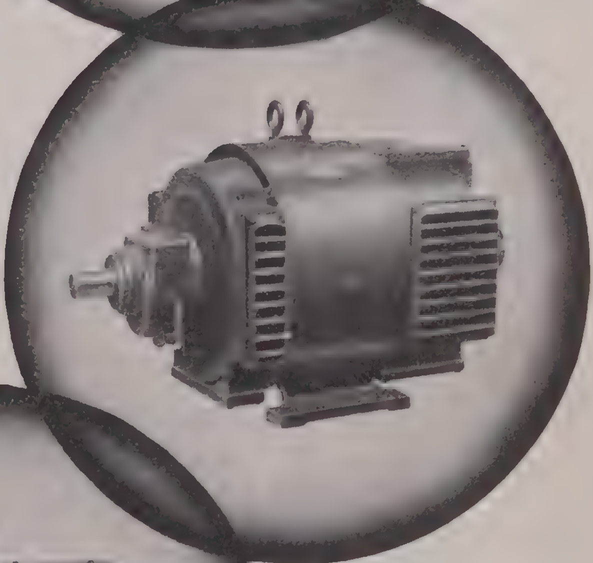

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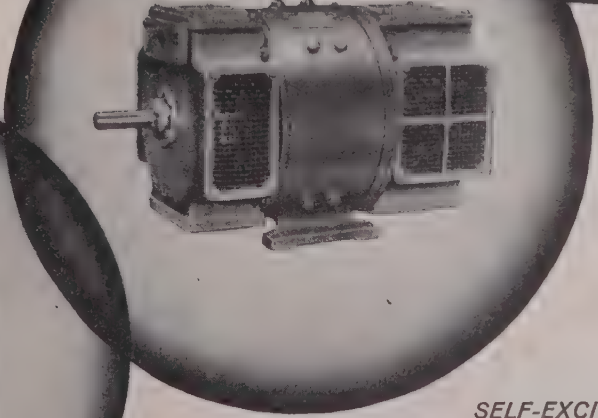

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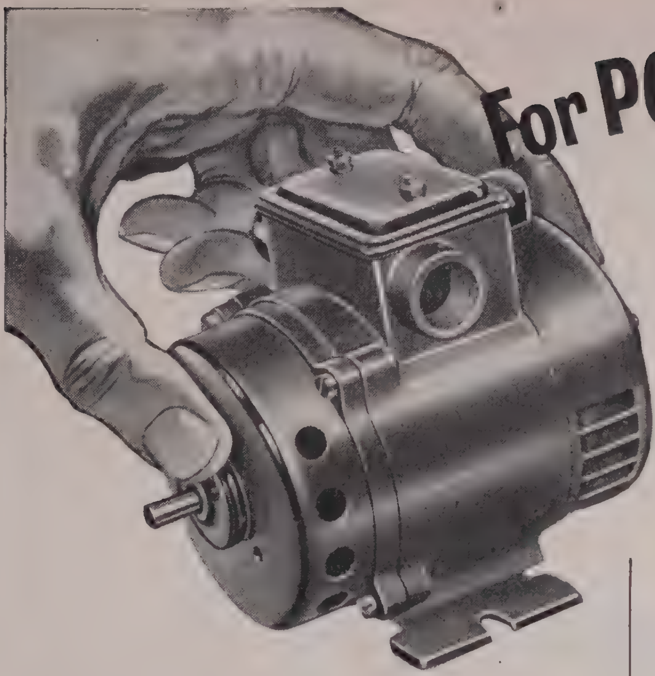

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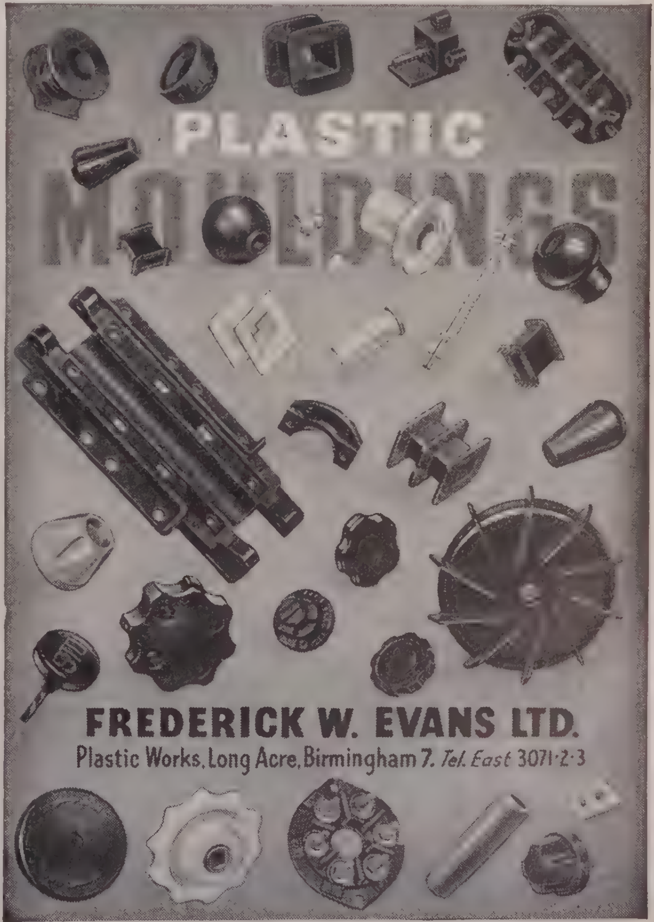

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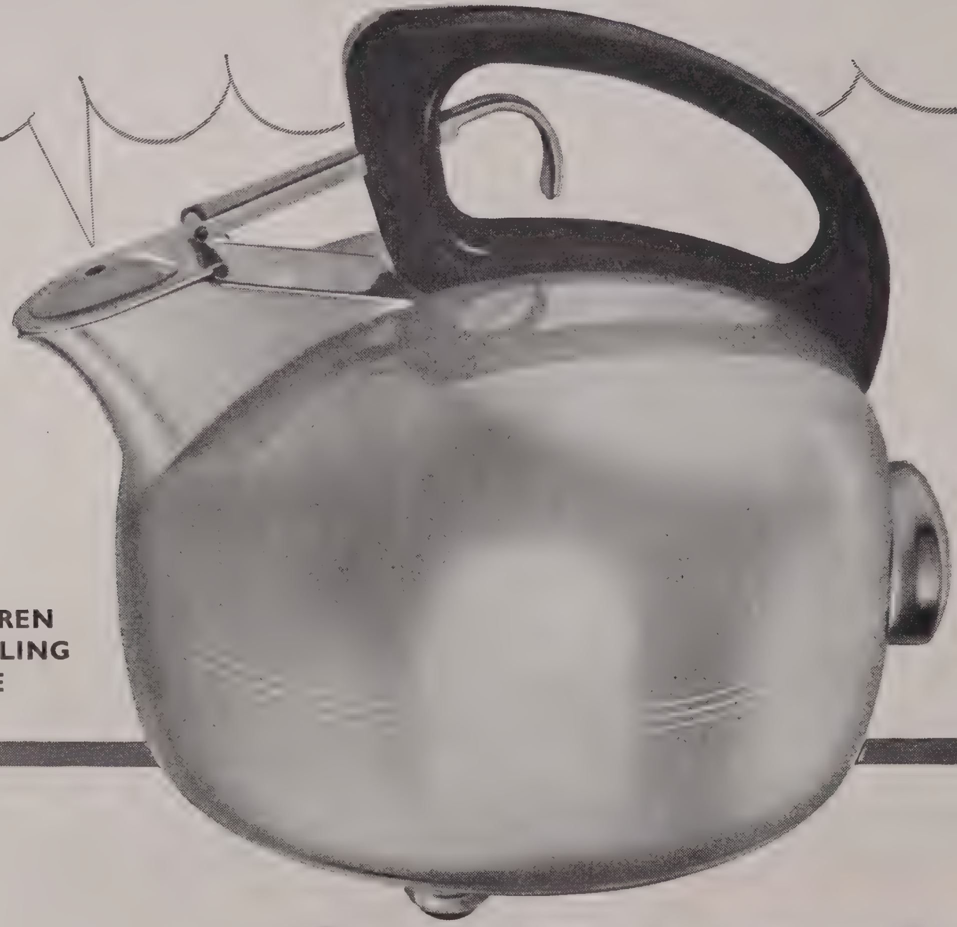

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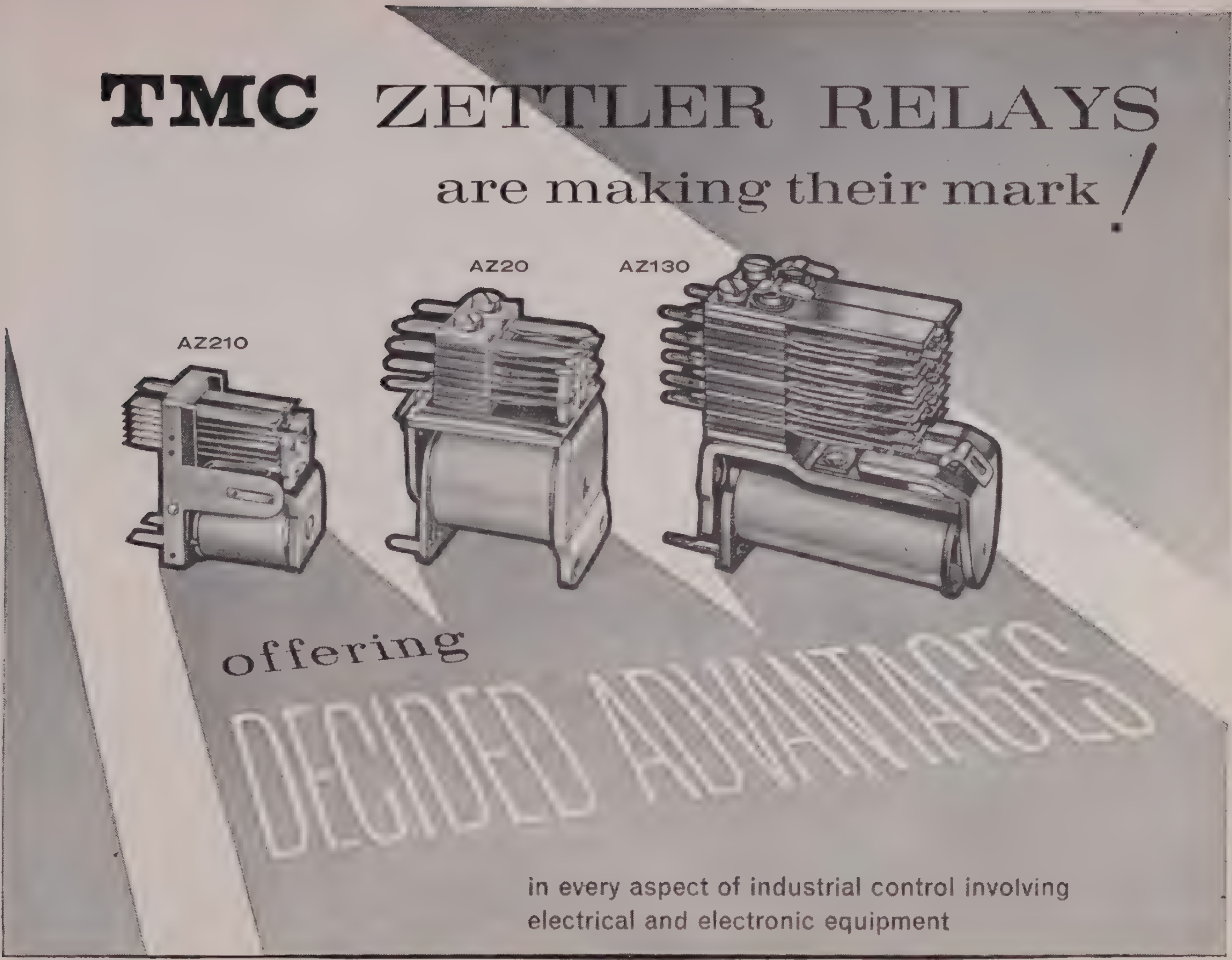

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INTERLOCKS

assure correct sequence control and increase safety

★ VIRTUALLY UNLIMITED DIFFERS

★ POSITIVE LOCKING

A safety lock, approved by the Central Electricity Generating Board, and backed by 70 years of lock manufacturing experience.

The "Engineers Manual of Interlocks and Allied Locking Devices" gives details of design, dimensional drawings and ordering arrangements. *Please write for a copy*

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Combination Works, **WILLENHALL, STAFFS.**

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Grams: Squirrels, WILLENHALL

METWAY

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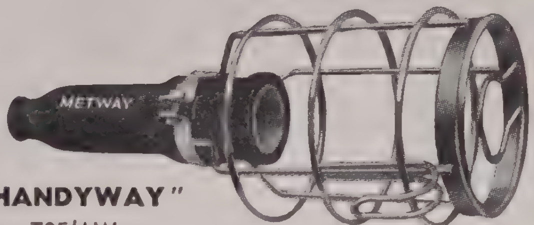
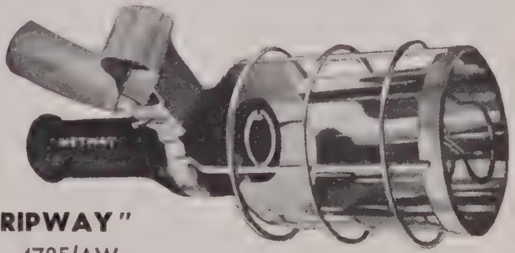
- RUBBER HANDLES
- B.C. PORCELAIN LAMPHOLDERS
- PLATED GUARDS



"HANDYWAY"
Type 705/AW.
8/11 EACH.

Type 2705/AWS with switch. **11/11** each.



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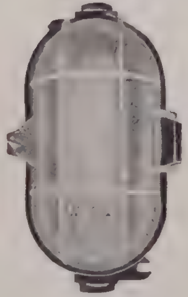
ALL INSULATED BULKHEAD and WELL GLASS FITTINGS



Type 2682/PH Plastic diffuser	40 watts **10/6** each
Type 2650/PH With glass	60 watts **9/8** each
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With porcelain tops tapped $\frac{3}{4}$" conduit

Type 917 PH	60 watt	**12/4**
Type 918 PH	100 watt	**17/8**

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Type 917/5647 60 watt	**16/8**
Type 918/5648 100 watt	**25/4**

ALL PRICES ARE INCLUSIVE OF LAMPHOLDERS

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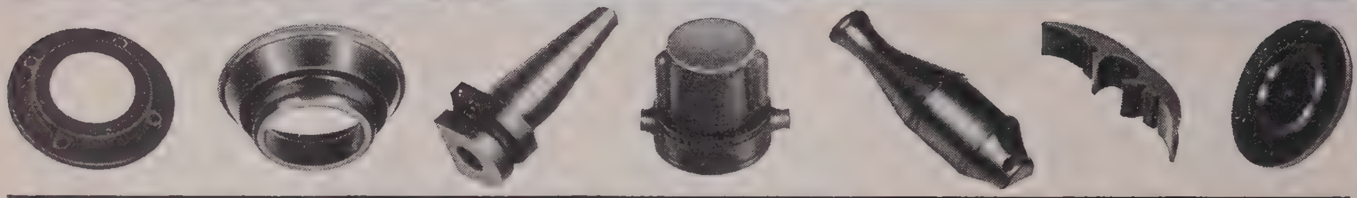

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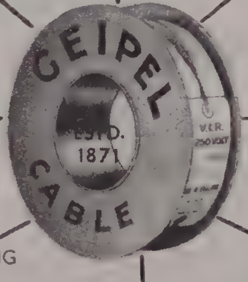

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TMB/161. This E.S. Type is available either with or without pull switch and can also be supplied for exposed lamp.

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The above types can be supplied in BROWN. Both types available BC and ES.

Further types of wall brackets are detailed on page 20 of our 34 page illustrated Brochure 1453/ER and you are invited to apply for a copy. The Brochure also gives information of over 400 Tunion products.

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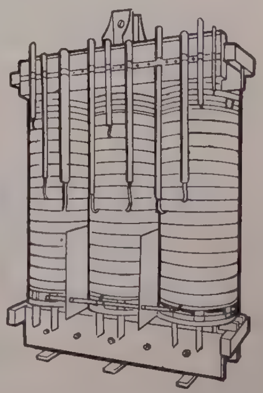

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Oldfield Works, Atlantic Street
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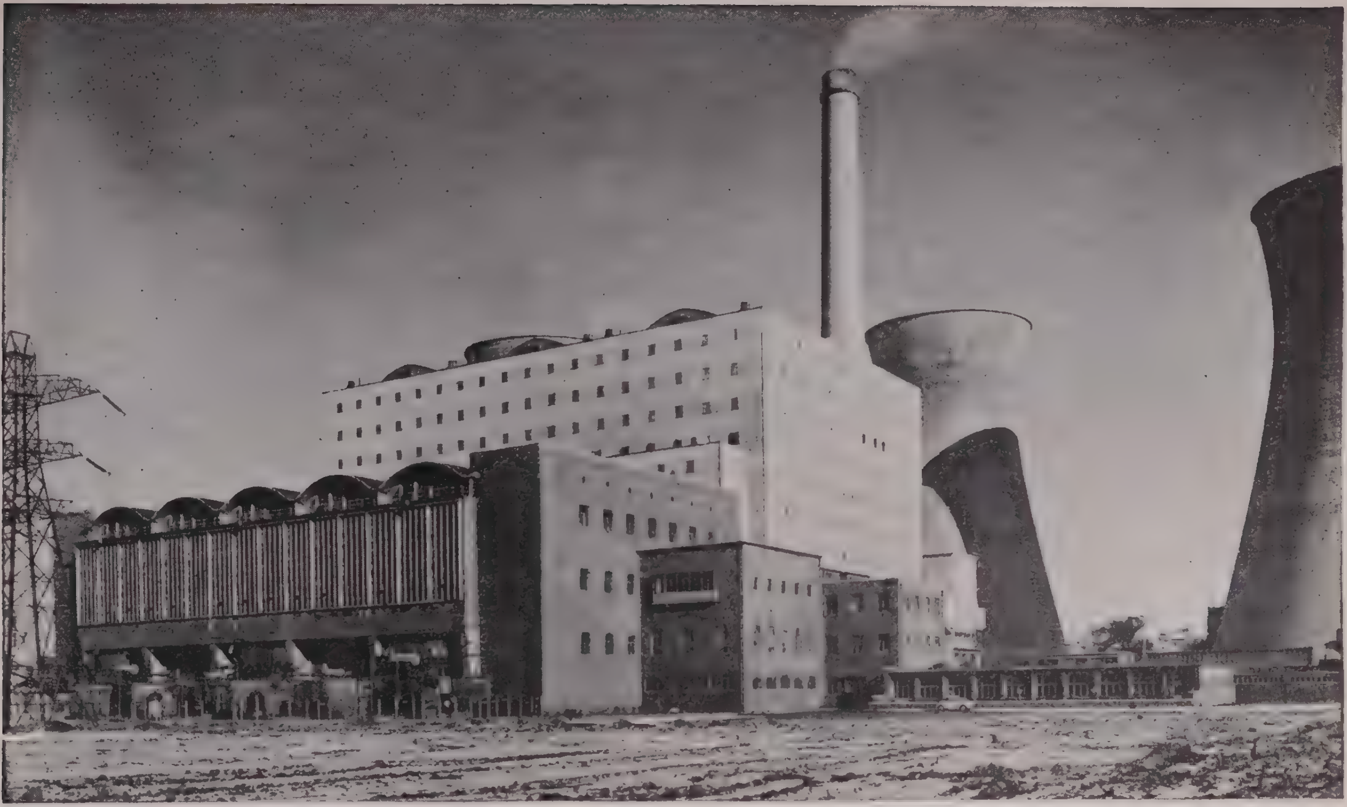
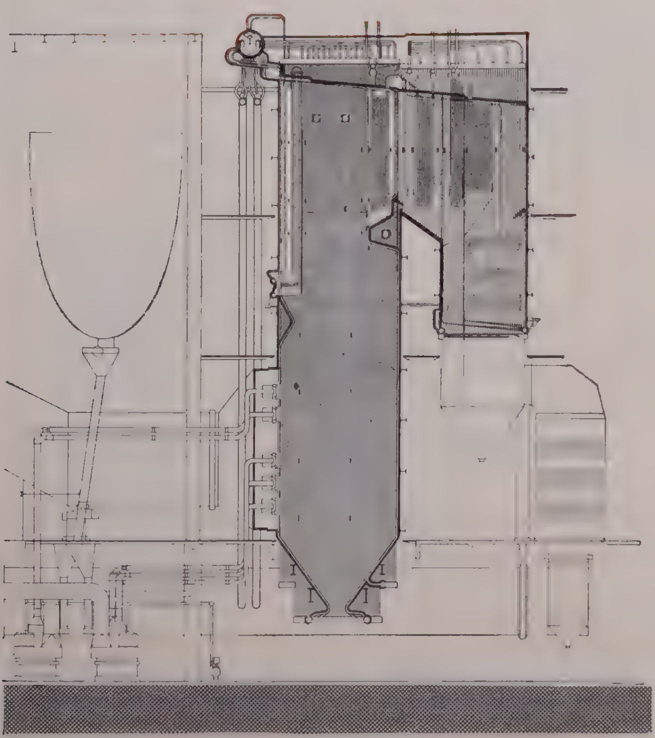


Ferrybridge 'B' power station;
Yorkshire Division, Central Electricity Generating Board.

BABCOCK at *Ferrybridge 'B'*

STEAM-RAISING PLANT



THREE 760,000 lb./hr., P.F.-FIRED, RADIANT-TYPE, 'REHEAT' BOILERS, steaming 100 MW GENERATORS

The Ferrybridge 'B' power station is one of the first to be commissioned of the Central Electricity Generating Board's modern "reheat" installations; with its three Radiant-type reheat boilers, all supplied by the Babcock organization and each steaming a 100 MW generator as a single boiler/turbine unit.

The boilers, each with a capacity of 760,000 lb./hr. M.C.R., at 1,600 lb./sq. in. and 985°F final temperature, with reheat to 955°F, are pulverized fuel-fired by 20 horizontal circular-type burners supplied from five Babcock type 'E' pulverizing mills, per boiler. Other Babcock equipment includes the automatic lighting-up and low-load-carrying oil burners, the automatic, sequence-controlled system of "Uni-directional-drive" and rack-type soot blowers; and Bailey boiler controls.

BABCOCK & WILCOX LTD., BABCOCK HOUSE, 209 EUSTON ROAD, LONDON, N.W.1

NICHROME* V, NICHROME,* CHROMAX* BY BRITISH DRIVER-HARRIS

Of the products we make, the Nichrome series of alloys is pre-eminent. The name Nichrome is registered as a Driver-Harris trade mark in some sixty countries. It is accredited the world's standard of quality for electrical resistance heating. Nichrome V and Nichrome (the two alloys in most demand today) were not perfected overnight. They have been developed over generations. We take care that this hard-won knowledge is worthily supported in the process of manufacture. At every stage quality is severely controlled and checked. The key craftsmen have many years' experience, and they have the use of impeccable equipment.

Nichrome* V is a nickel-chromium alloy of the 80/20 type. It is used for high temperature resistance heating applications at temperatures up to 1150°C. For resistor elements in such as electric furnaces, domestic cookers and fires, it is ideal. It can be supplied in wire, hot and cold rolled strip, hot rolled rounds, and ribbon form. It is also available in superfine sizes—.002 in. (0.05 mm.) downwards for applications like precision resistors in electronic equipment, and where high ohmic value is necessary.

Nichrome* is a nickel-chromium alloy of the 65/15 type. It is the accepted material for heating elements operating at temperatures up to 950°C, including all types of domestic appliances in this temperature range. It is also used for rheostat and resistance units. It makes for compact units capable of withstanding severe overloads and short circuits without damage or impairing circuits. It resists corrosion and has many non-electrical applications. It is available in the forms of wire, hot and cold rolled strip, hot rolled rounds, and ribbon. Also in superfine wire sizes.

Chromax* This alloy has the nominal composition 37% nickel, 18% chromium, balance iron. It has been developed for use in furnace elements, and particularly for carburising atmospheres.

For further information on Nichrome V and Nichrome, write for Data Sheet No. 5—a 24-page booklet.

*REGD. TRADE MARK

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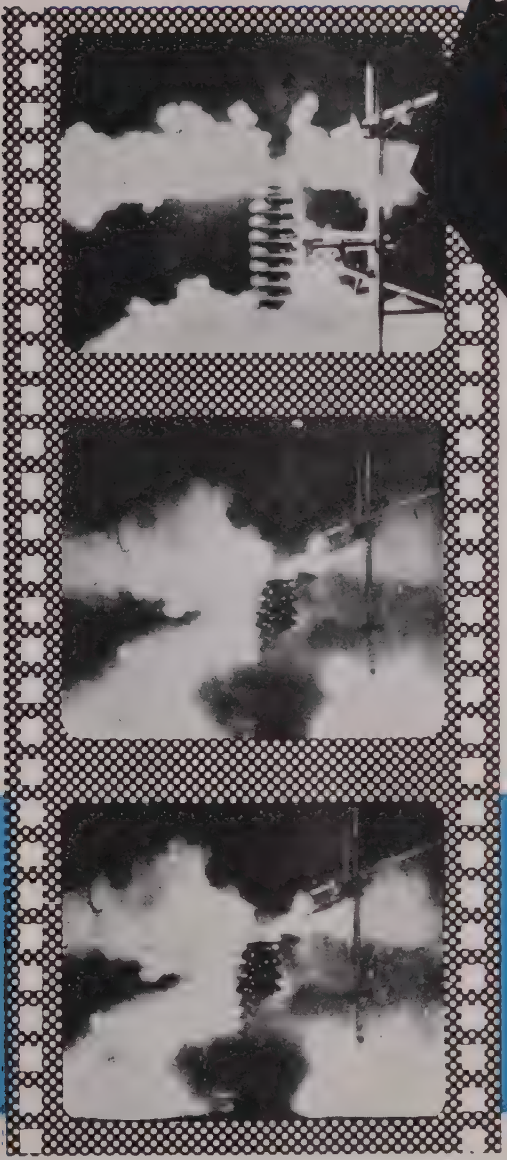
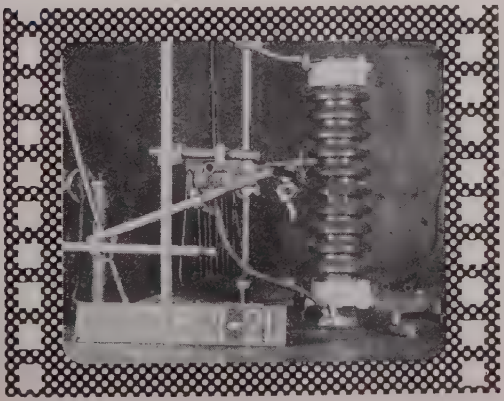
EMP ARRESTERS on pressure relief test



Here's further proof why you should specify EMP Heavy Duty Arresters. The Frames on the left have been taken from a high speed motion film. These pictures show EMP Heavy Duty Arresters, with internal parts deliberately damaged, then subjected to a symmetrical rms current of approx. 20,000 amps. (41,600 amps. peak). It is clearly shown that the arrester housings survived this fault with all parts completely intact. Should an arrester fail—due to unforeseen conditions—its ability to remain physically intact may save costly damage to adjacent equipment. Make sure—specify EMP Heavy Duty Arresters.

EMP heavy duty arresters on test survive an immense fault current and remain . . .



. . . intact!

EMP Electric Ltd.

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In addition to Rubber Mouldings, John Bull products include Boots and Gaiters, Convoluted Hose, Shaped Hoses and Hand Grips.

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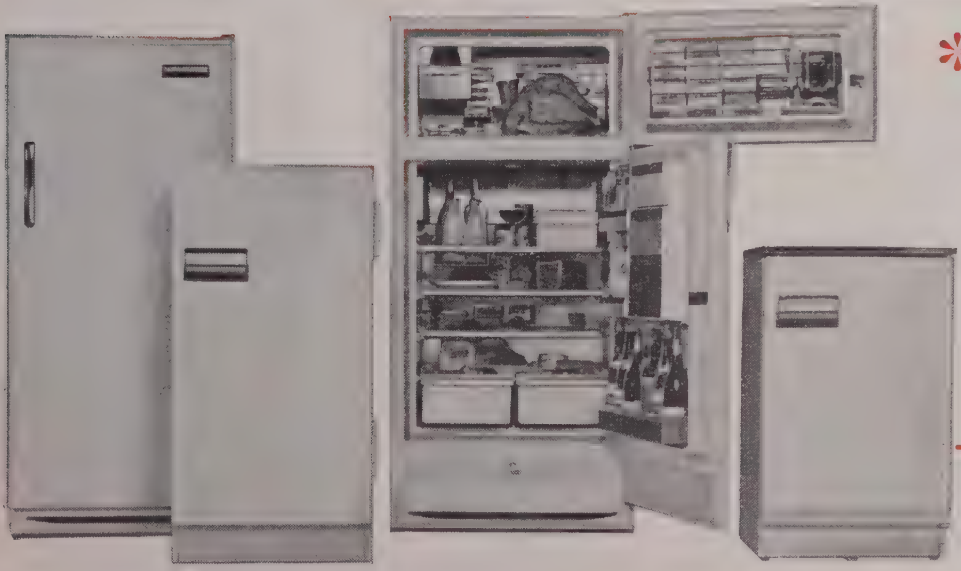
* NEW KENWOOD CHEF

Brilliantly designed *new* model of the famous Kenwood Chef . . . most versatile food preparation machine in the world!



* NEW KENWOOD NORGE REFRIGERATORS

Kenwood Norge is the big name of the future in big-capacity refrigerators. From 4.1 cu. ft. to 13.3 cu. ft. . . . with the 'Sheer Look' outside, 'Sheer Space' inside.

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WPS 171

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MERCURY VAPOUR CONCENTRATION METER Type E.3472

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Two sensitivities are available at the touch of a switch, giving either full scale reading at a concentration of 770 micro-grammes per cubic metre of air or full scale meter reading at a concentration of 200 micro-grammes. Terminations are provided at rear for operation of a recorder to give continuous readings of concentration present.

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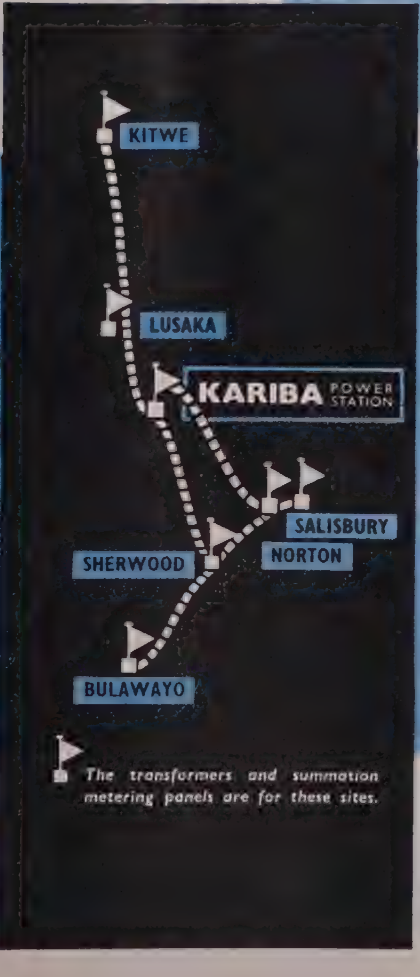
dm GB38

One of the two Ferranti 120,000 kVA 330/234 kV auto transformer and series booster installations at the Kitwe sub-station.

FERRANTI at KARIBA

Ferranti Summation Metering Panels for the Kariba Power Station.



The transformers and summation metering panels are for these sites.

TRANSFORMERS

All the sub-station transformers for the Kariba Hydro-Electric Scheme are being supplied by Ferranti Ltd. They comprise two 120,000 kVA, 330/234 kV 3-phase auto transformers with series boosters, eight 60,000 kVA, 330/88kV and four 60,000 kVA, 330/33 kV 3-phase double wound transformers. The transformer installations at Norton, Lusaka and Kitwe are complete. Work at Salisbury, Bulawayo and Sherwood is well advanced.

SUMMATION METERING

For the same scheme Ferranti Ltd. are supplying Summation Metering Equipment comprising: Precision grade integrating meters, Electro-mechanical summators, Printometer Demand Recorders and Suites of metering cubicles. These equipments will be used to meter six 100 MW generator sets at Kariba Power Station and also the supplies to the Transforming Stations at Kitwe, Norton, Salisbury, Lusaka, Sherwood and Bulawayo.

The consulting electrical and mechanical engineers are Messrs. Merz & McLellan.

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Ferranti

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ELECTRIC BLANKET CONTROL SWITCH

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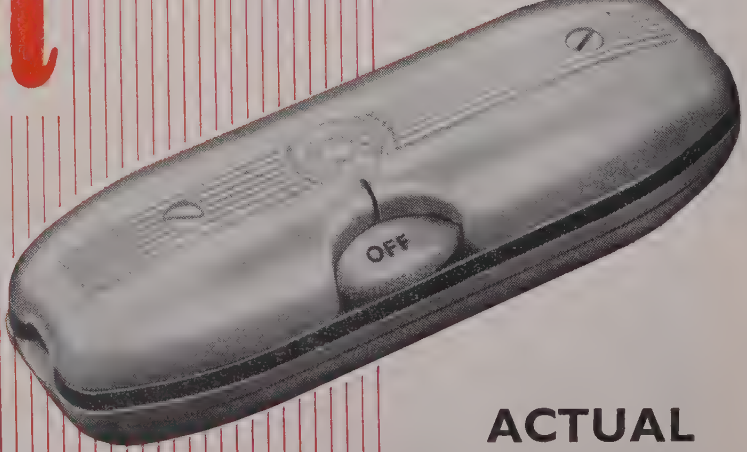
- Fused
- Double Pole Off
- Ambient Temperature Compensation
- Simple cable grip that will take any size cable
- Suitable for any blanket loading



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SWITCHES

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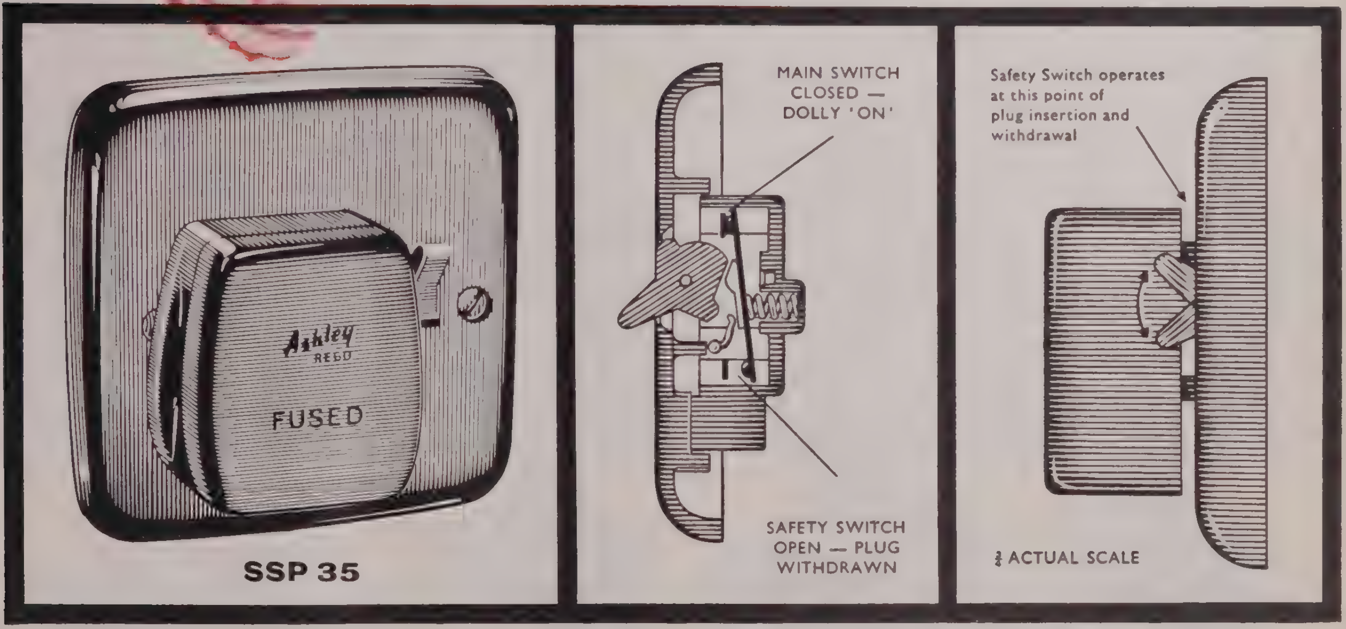
In nature perfection is reflected in infinite detail not apparent to the casual eye.

So too with Ashley Accessories — "there's more than meets the eye".

This means good design and materials, the best equipment, constant inspection and extra effort on the part of everyone.

We think it is worthwhile.


Ashley
REGD
FUSED
SSP 35
MAIN SWITCH CLOSED — DOLLY 'ON'
SAFETY SWITCH OPEN — PLUG WITHDRAWN
Safety Switch operates at this point of plug insertion and withdrawal
¾ ACTUAL SCALE

13 AMP SWITCHSOCKETS		
CAT No	DOZ LIST	TYPE
SS 31	69/-	Surface Br
SS 32	76/-	Surface Cr
SS 35	67/-	Flush Br
SS 36	74/-	Flush Cr
HEAVY DUTY		
SS 41	92/8	Surface Blk
SS 45	81/4	Flush Blk

13 AMP FUSED PLUGS		
PG 13	34/-	Brown
PG 14	38/-	Cream
HEAVY DUTY		
PG 15	49/-	Black

ASHLEY 13 AMP SWITCHSOCKET WITH SAFETY SWITCH

The 'Ashley' safety device effectively prevents fingers from touching "live" pins during plug insertion or withdrawal — the pins only being "live" when almost home.

OPERATION: Two switches are used in series in the Line circuit, one (main switch) is controlled by the dolly; the other (safety switch) by the plug. Regardless of dolly position, the Safety Switch controls output during plug insertion or withdrawal. Both switches are fully rated.

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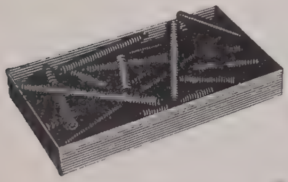
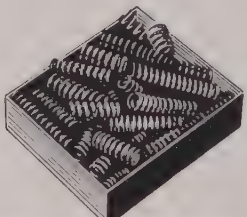
THAT *Experimental Spring* YOU WANT IS WAITING FOR YOU IN THIS BOX . . .

No. 1217. One gross Assorted Springs. A complete Garage Service Kit. 42/- each.

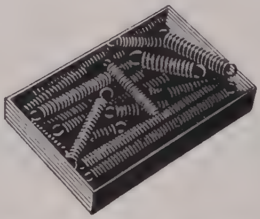
If not, try another box in the Terry Assorted Springs range



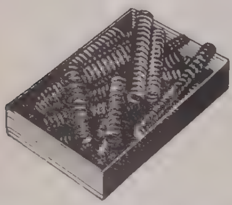
No. 1200. Three dozen Assorted Light Expansion Springs, suitable for carburettor control, etc. **13/6.**



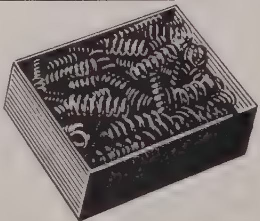
No. 98A. Three dozen Assorted 1" to 4" long, $\frac{1}{2}$" to $\frac{3}{4}$" diam., 19G to 15G. **5/6.**



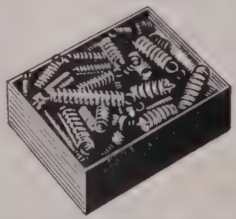
No. 753. Three dozen Assorted Light Expansion $\frac{1}{4}$" to $\frac{1}{2}$" diam., 2" to 6" long, 22 to 18 S.W.G. **10/6.**



No. 760. Three dozen Assorted Light Compression Springs. 1" to 4" long, 22 to 18 S.W.G., $\frac{1}{4}$" to $\frac{1}{2}$" diam. **6/6.**



No. 757. Extra Light Compression, 1 gross Assorted, $\frac{1}{8}$" to $\frac{7}{16}$" diam., $\frac{1}{2}$" to $2\frac{1}{2}$" long, 27 to 19 S.W.G. **15/-.**



No. 758. Fine Expansion Springs. 1 gross Assorted $\frac{1}{8}$" to $\frac{3}{8}$" diam., $\frac{1}{2}$" to 2" long, 27 to 20 S.W.G. **15/-.**

We know *exactly* how difficult it is to find springs for experimental work . . . we've been making quality springs for over 100 years. So, we confidently offer you our excellent range of small boxed assortments which covers a very wide range.

We can only show a *few* boxes. Send us a p.c. for our full list.

If ever you are stuck with a spring problem let our Research Department put their long experience at your disposal.

Have you a Presswork problem?

If so, the help of our Design Staff is yours for the asking.

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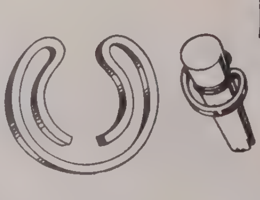
for **SPRINGS**

Really interested in Springs? "Spring Design and Calculations" 9th Edition tells all—post free 12/6.



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& SONS LTD
Redditch, Worcs.

(Makers of Quality Springs, Wireforms and Presswork for over 100 years)

HT30

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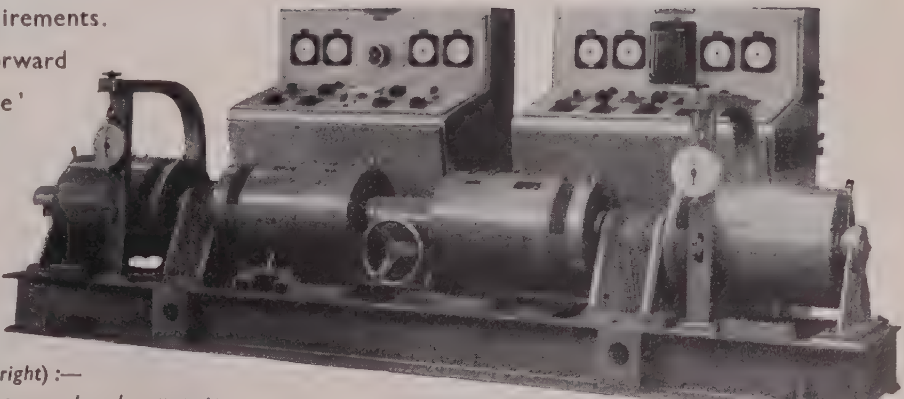
E.D.C.C. machines and control gear are available to meet most requirements. Standard units for straightforward applications and 'tailor made' specials for the most diverse uses.

Recently supplied to the Welsh College of Advanced Technology, Cardiff—a multiple motor generator set, comprising 4 machines and two control desks.

The machine unit comprises (left to right) :—

- *7 h.p. D.C. variable speed motor, arranged as dynamometer, complete with Tacho-generator*
- *4 kVA alternator*
- *4 kVA alternator with rotatable stator*
- *7 h.p. synchronous motor, arranged as dynamometer*



● *The complete unit can be split into two motor-alternator sets*

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P.2827

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In PAKS from 25 to 600 pounds complete, if required, with stillages and 'take-off' units.

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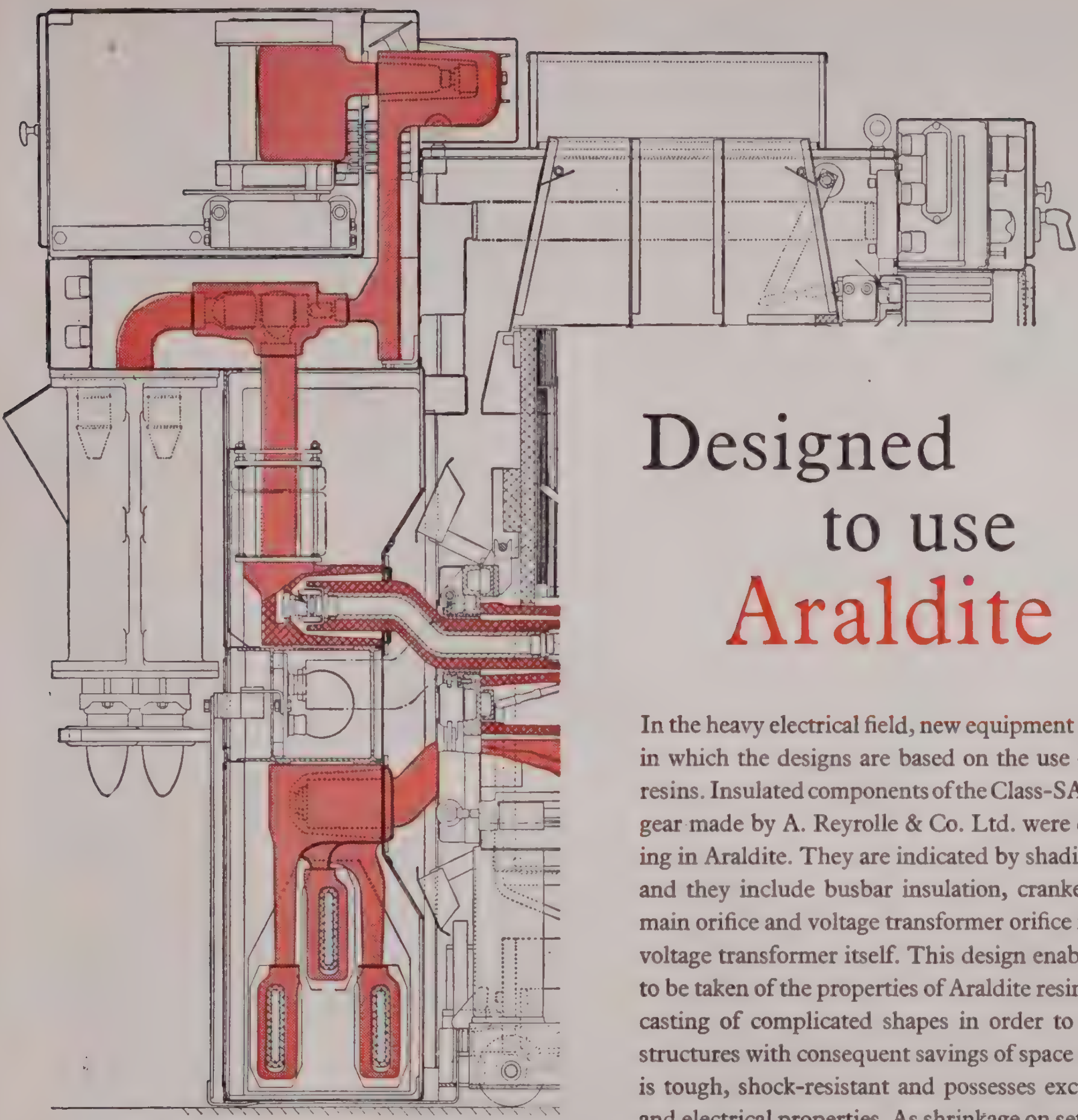
Kew Works · Bracknell · Berkshire



Designed to use Araldite

In the heavy electrical field, new equipment is being produced in which the designs are based on the use of Araldite epoxy resins. Insulated components of the Class-SA air-break switchgear made by A. Reyrolle & Co. Ltd. were designed for casting in Araldite. They are indicated by shading in the diagram and they include busbar insulation, cranked plug insulator, main orifice and voltage transformer orifice insulators and the voltage transformer itself. This design enables full advantage to be taken of the properties of Araldite resins which allow the casting of complicated shapes in order to provide compact structures with consequent savings of space and cost. Araldite is tough, shock-resistant and possesses excellent mechanical and electrical properties. As shrinkage on setting is negligible, dimensional accuracy can be maintained within very close limits. Remarkable adhesion to metals makes Araldite particularly suitable for composite structures.

Insulated components of 11,000V Class-SA
500 MVA air-break switchgear by
A. Reyrolle & Co. Ltd., cast in Araldite.

Araldite

EPOXY RESINS

Araldite is a registered trade name

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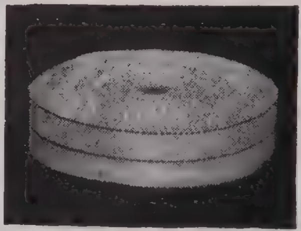
AP541

Types of Tapes

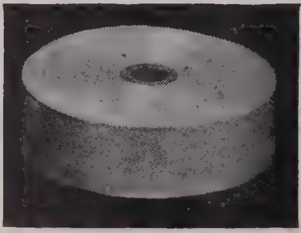
COVERING ALL

INSULATION REQUIREMENTS



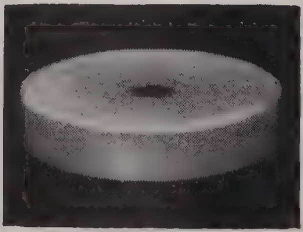
PYROFLEX Regd.

Asbestos Tape has been specially designed for the electrical industry. It is manufactured from carefully selected and purified fibres and has a wide application for Class B insulation.



DURAGLAS Regd.

Duraglas glass-fibre tapes have many applications within the electrical insulation field such as, conductor insulation, coil wrappings, core bindings, mechanical reinforcements, cable wrappings and heat resistant protective coverings.



p.t.f.e.

p.t.f.e. has exceptionally good dielectric properties, is non-tracking, non-flammable, resistant to moisture and totally unaffected by weathering conditions. As a result it has a wide application in the electrical industry in the form of tape for the insulation of cables, motors and transformers.

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efficient... versatile... economical...

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Both the AS two-screw saddles and the SAS single-screw saddles, fulfil every requirement for cable security, time saving in assembly and reduction in installation costs wherever electrical wiring is required.

They combine immense strength and high insulation value with freedom from corrosion and electrolytic action—and will accommodate cables in every combination for both direct-to-wall and in conjunction with standard slotted cable racking.

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- ✶ Made from immensely strong nylon.
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- ✶ No need to carry large stocks of components

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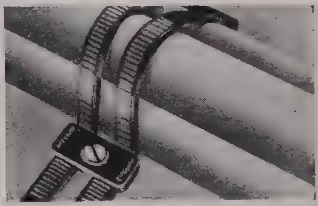
Only 3 sizes are required to cover the most complex cable assembly.



TYPE sas

TWO POINT SINGLE SCREW FIXING

Developed from type AS above, but specially adapted for use with standard cable racking.

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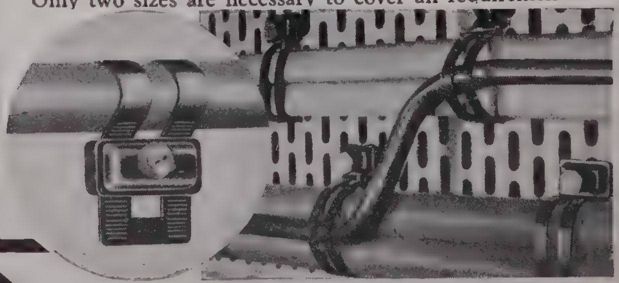

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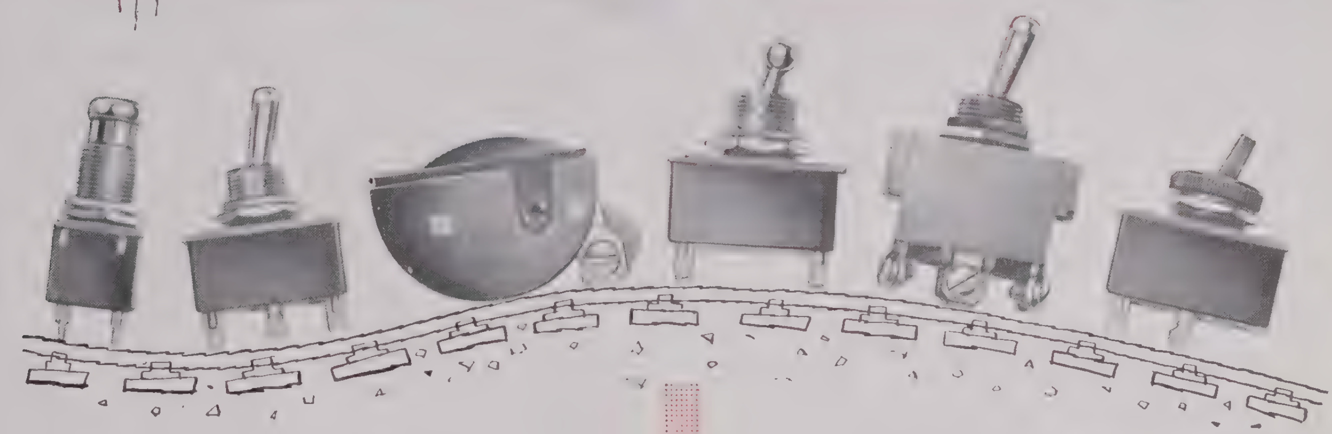

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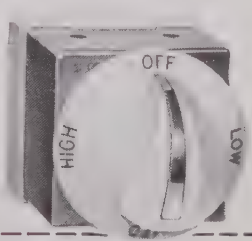

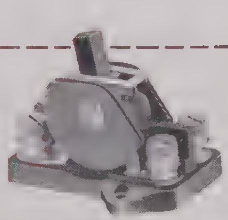

ARROW precision built tumbler switches for heavy lighting loads and motor control.

ARROW trigger lever switches for light, medium and heavy portable tools.

ARROW double lever switches for the collective or selective switching of two elements or small motor and one element.

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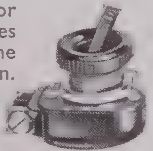

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Long-life, proved reliability, high current carrying capacity, make Paper Insulated Cables the first choice for most distribution installations.

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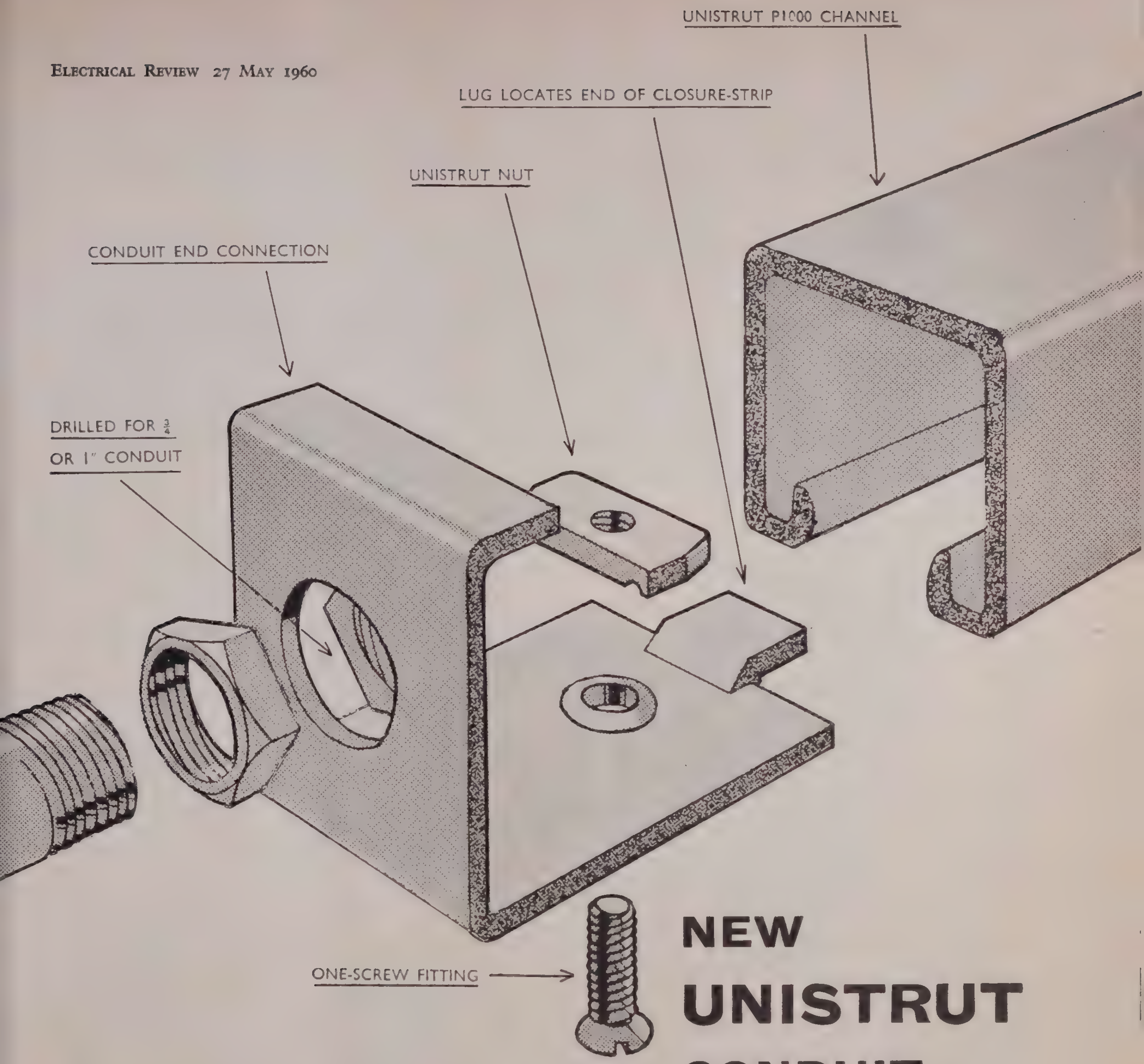


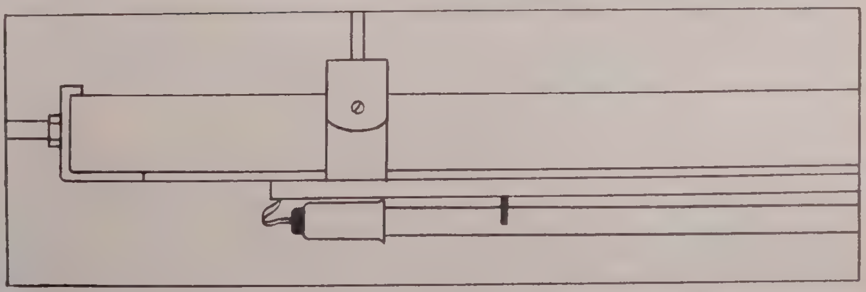
NEW UNISTRUT CONDUIT END CONNECTIONS

SPEEDS FLUORESCENT INSTALLATION

This new component neatly and quickly effects the change-over from conduit to Unistrut channel where the latter is used as fluorescent lighting trunking. It is secured by a single screw to a self-locating nut in the channel, and is supplied ready drilled for either 1" or ¾" conduit.

The connection may be used either where the individual fluorescent fittings are secured direct to the Unistrut channel, or where the channel is clamped to high roof-beams, etc. with the individual fittings on droppers. In either case, wiring accommodated in the channel is neatly concealed by a snap-in closer strip.

The Unistrut conduit end connection is available in Unistrut green stove enamel finish or electro-plated. Please write for drawings to include in your Unistrut Parts Catalogue.



For information on the Unistrut system in fluorescent lighting trunking and other electrical applications, please write to:–

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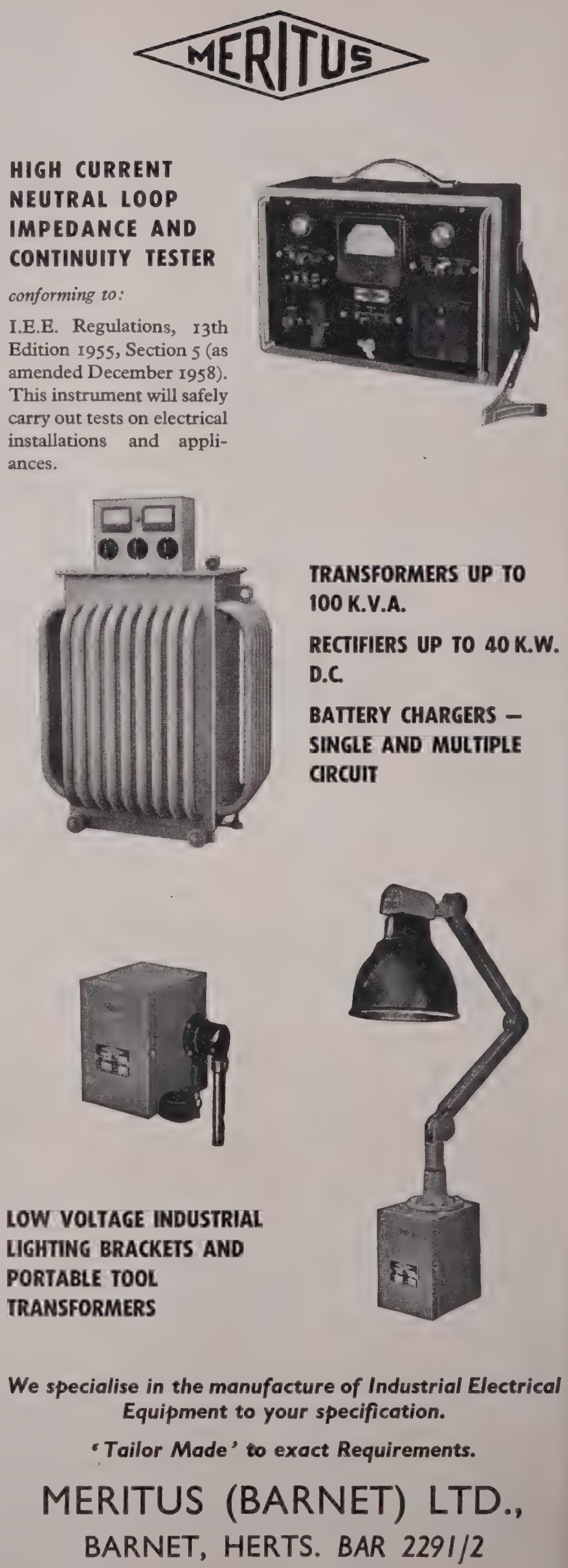

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We specialise in the manufacture of Industrial Electrical Equipment to your specification.

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How to save up to 30% on wiring costs

Think of the time required for terminating and testing M.I. Cables.

Think of the money saved if this is done before they are delivered.

BICC BRINGS THE FACTORY TO THE WIREMAN

Wiring units consist of M.I. cables assembled in the factory. Cables are cut to the customer's specified length, sealed — and if required fitted with glands or other accessories.

After comprehensive testing the units, which can be colour or code identified as required, are dispatched in suitable containers.

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Wiring units are ideal for the repetition wiring of offices, housing estates and blocks of flats.

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Here are Further Advantages–

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No special M.I. tools are needed.

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All units are pre-tested TWICE before leaving the factory.

The time saved leads to drastically reduced installation costs: UP TO 30%.

Any size of M.I. cable can be provided in wiring unit form and, because of factory mass production facilities, they can be produced at a very low cost providing that sufficient quantities of identical units are ordered.

M.I. CABLES

consist of fully annealed copper conductors in a compressed mineral insulant within a solid-drawn copper sheath. They are designed for both power and lighting applications, and have exceptional strength and electrical stability.

M.I. cables are fireproof, waterproof, mechanically tough, non-ageing and easily installed.

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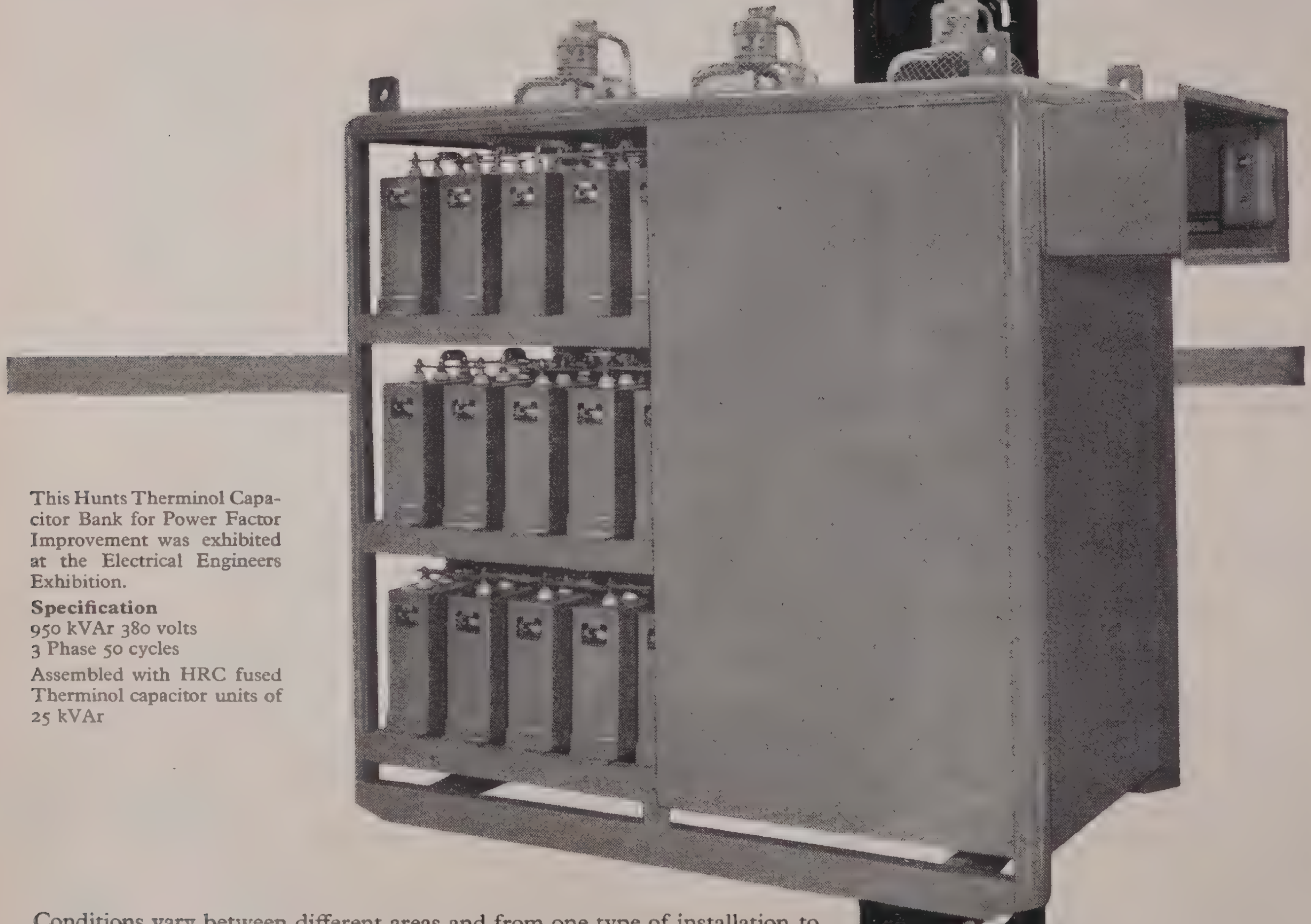

This Hunts Therminol Capacitor Bank for Power Factor Improvement was exhibited at the Electrical Engineers Exhibition.

Specification
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Assembled with HRC fused Therminol capacitor units of 25 kVAr

Conditions vary between different areas and from one type of installation to another and you are invited to discuss your electrical power installation with our technical staff. Free advice and if necessary a report and estimate will enable you to judge whether the conditions of power consumption in your plant are needlessly wasteful. Anticipated annual savings sometimes running into many hundreds of pounds will show just how soon the capital outlay is recovered by the increase in electrical efficiency. Thereafter you will enjoy a net saving through reduced electricity costs.

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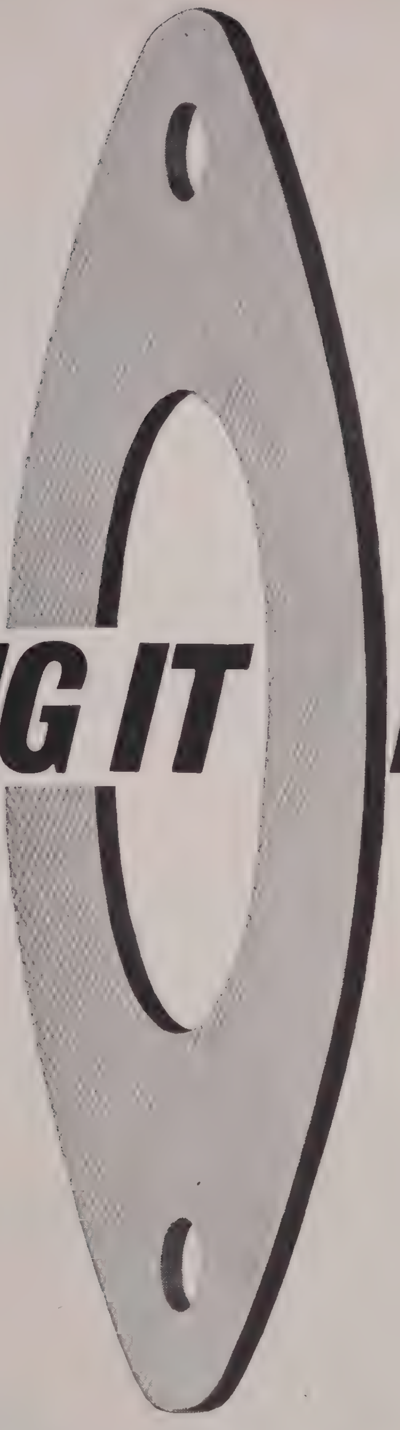

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As you may know, we have been punching it home in past advertisements that Tufnol can be punched and machined with ease, speed and economy. And because this most versatile laminated plastics material is also corrosion resistant and an electrical insulator, Tufnol punchings are exactly suited to components for the aircraft, motor and electronic industries, and in all branches of electrical and mechanical service. Tufnol punchings can be produced to your specification in our factory; alternatively, Tufnol can be supplied in sheets or strips for punching in your own workshops.
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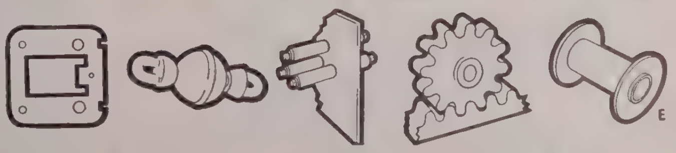

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Ideal for stand-by batteries for hospitals, cinemas, etc., and general country house and farm lighting purposes.

All cells are built to British Standard Specification and are exactly as supplied to G.P.O. for telephone exchanges and British Electricity Authority. They are delivered in the U.K. filled with acid, fully charged, ready for use.

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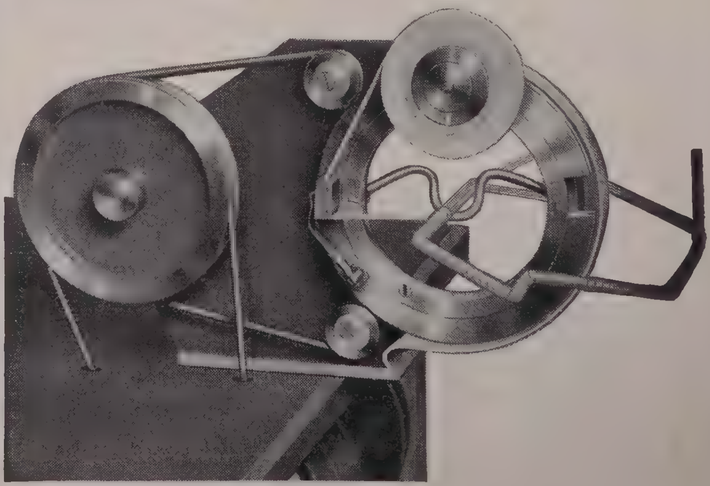
Taping machines

SPEEDY Taping for all type coils

Tapes stator and armature coils quickly and neatly. Other applications are the taping of busbars, wiring harnesses, etc.

A necessity for repairs or production, and an ideal companion to a "QUICKWAY" Coilwinding and Forming Machine.

We can offer individual items with the machine such as clutch unit and motor, or a complete arrangement with bench.



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THE MIDLAND DYNAMO CO. LTD.
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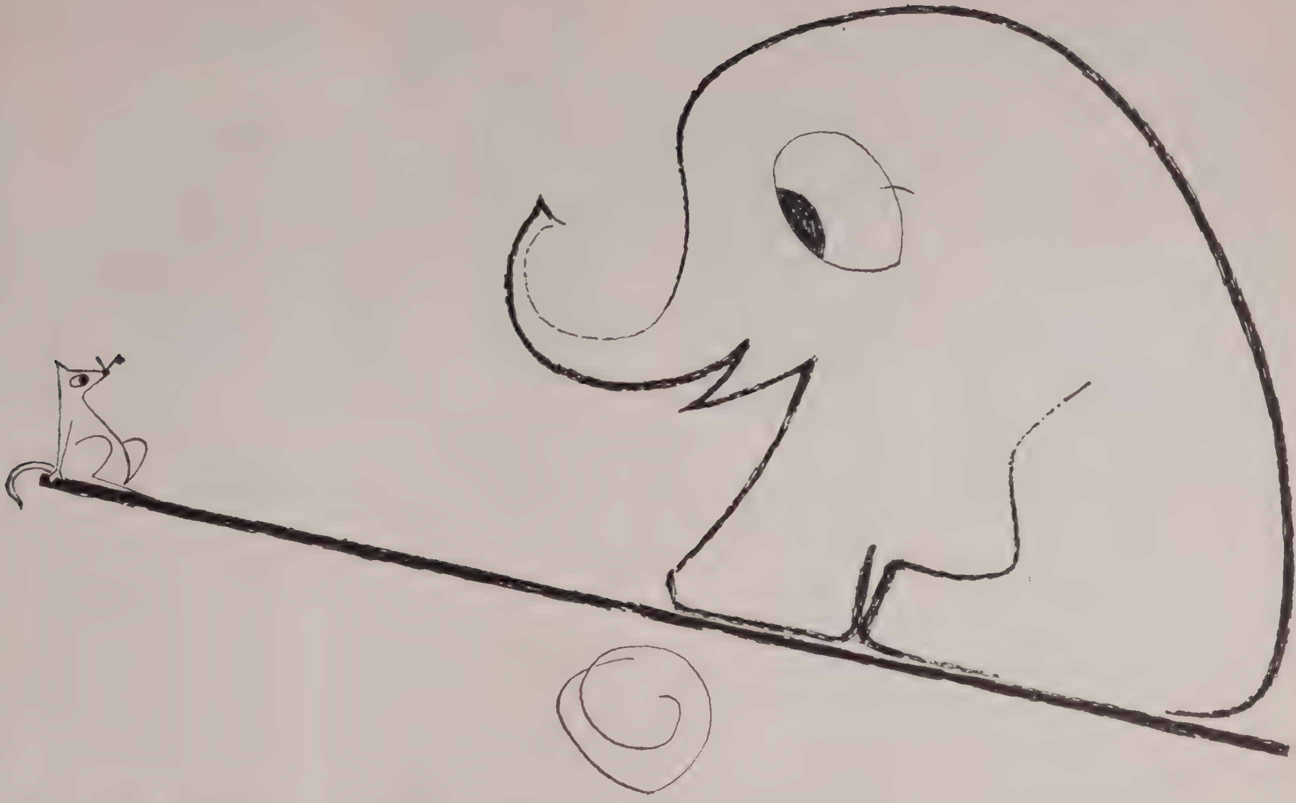
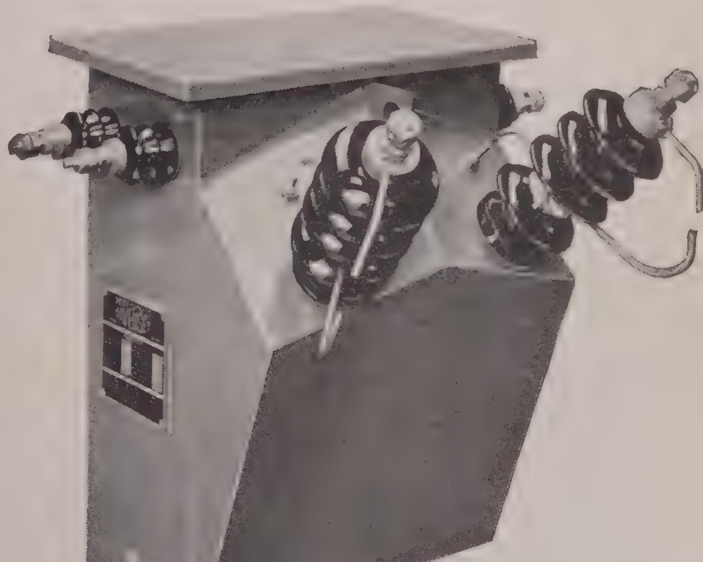


up and down the country

round and round the world, DAVENSET Transformers are being used in ever increasing quantities because they are dependable. Discerning buyers everywhere are specifying DAVENSET Transformers because they are made under modern conditions using advanced design techniques that combine quality with lowest cost. If you use transformers you should investigate the DAVENSET range of single and three phase units, available in sizes from 5 VA to 500 kVA for operation under any climatic or artificial conditions.



DAVENSET Transformers are supreme for :—

Distribution of electricity in Rural Areas.
Electric Furnaces.
Low voltage Tools and Handlamps.
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Soil heating.
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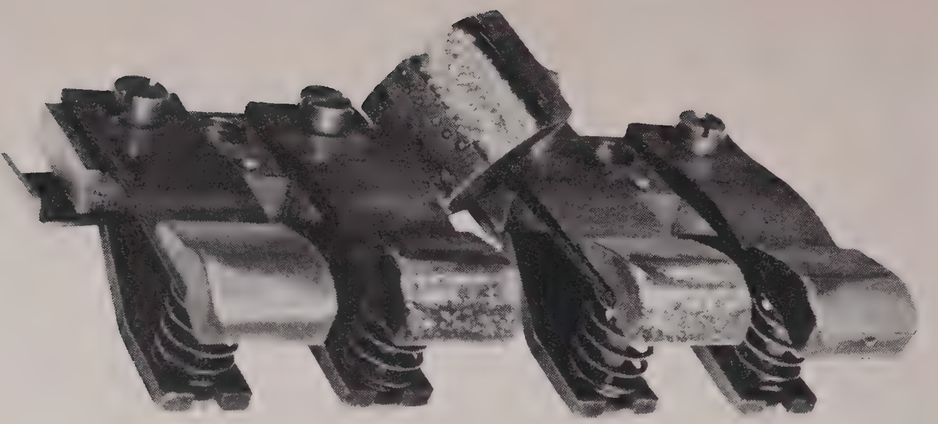
Lighting and heating.
Low voltage machine lighting.
All other industrial transformer applications.

DAVENSET TRANSFORMERS

Designed and built to withstand the test of time

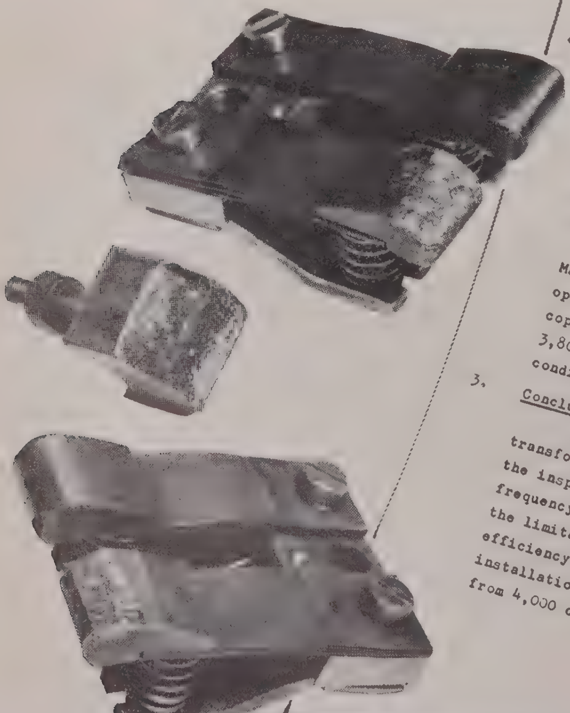
PARTRIDGE, WILSON & CO. LTD., DAVENSET ELECTRICAL WORKS, LEICESTER. Telephone 37291/5

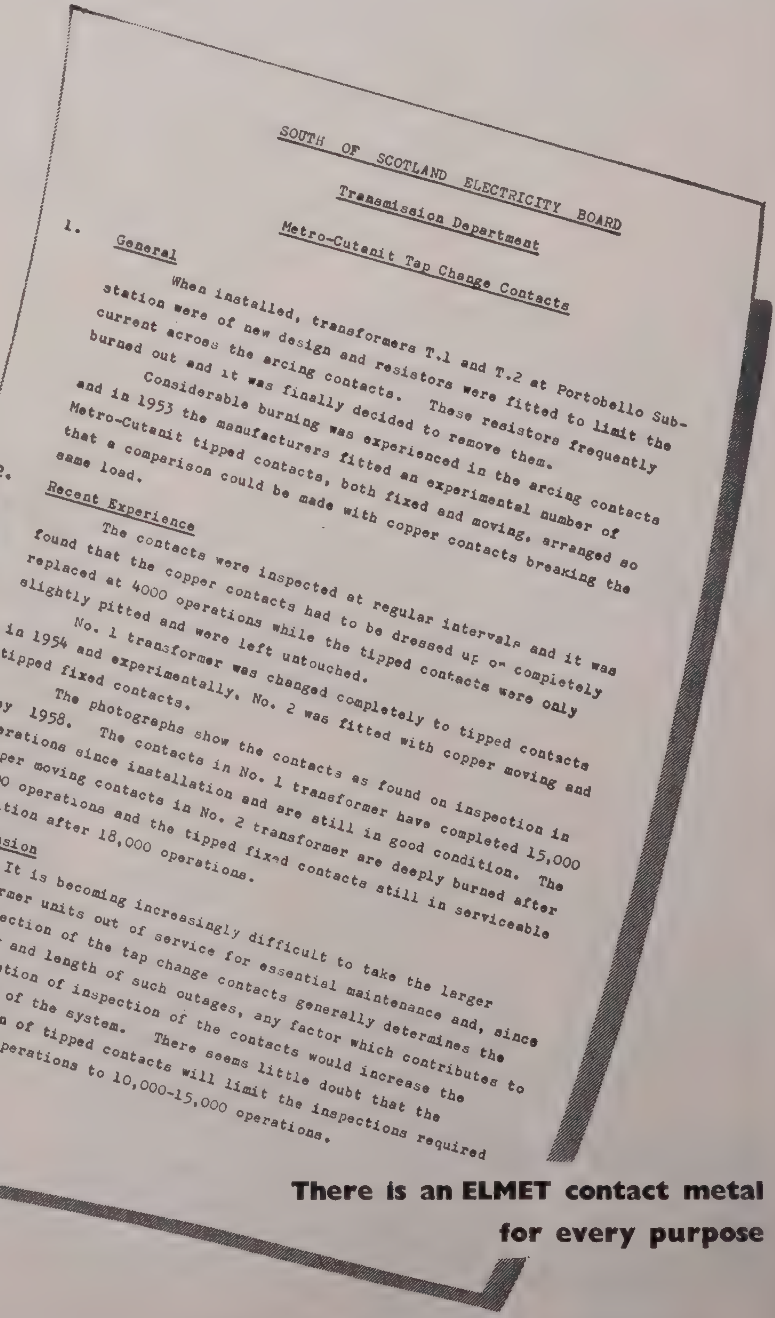
These pictures tell a story



ELMET facings increase transformer tap change contact inspection interval from 4,000 operations to 10,000—15,000 operations

THESE UNRETOUCHED PHOTOGRAPHS show tap-change contacts exactly as removed from No. 1 Transformer (upper group) and No. 2 Transformer (lower group) at the Portobello Sub-Station of the South of Scotland Electricity Board. The following official report by the Board's Engineering Department fully explains their significance. The report is reproduced by permission of the Board.





SOUTH OF SCOTLAND ELECTRICITY BOARD

Transmission Department

Metro-Cutanit Tap Change Contacts

1. General

When installed, transformers T.1 and T.2 at Portobello Sub-station were of new design and resistors were fitted to limit the current across the arcing contacts. These resistors frequently burned out and it was finally decided to remove them.

Considerable burning was experienced in the arcing contacts and in 1953 the manufacturers fitted an experimental number of Metro-Cutanit tipped contacts, both fixed and moving, arranged so that a comparison could be made with copper contacts breaking the same load.

2. Recent Experience

The contacts were inspected at regular intervals and it was found that the copper contacts had to be dressed up or completely replaced at 4000 operations while the tipped contacts were only slightly pitted and were left untouched.

No. 1 transformer was changed completely to tipped contacts in 1954 and experimentally, No. 2 was fitted with copper moving and tipped fixed contacts.

The photographs show the contacts as found on inspection in May 1958. The contacts in No. 1 transformer have completed 15,000 operations since installation and are still in good condition. The copper moving contacts in No. 2 transformer are deeply burned after 3,800 operations and the tipped fixed contacts still in serviceable condition after 18,000 operations.

3. Conclusion

It is becoming increasingly difficult to take the larger transformer units out of service for essential maintenance and, since the inspection of the tap change contacts generally determines the frequency and length of such outages, any factor which contributes to the limitation of inspection of the contacts would increase the efficiency of the system. There seems little doubt that the installation of tipped contacts will limit the inspections required from 4,000 operations to 10,000-15,000 operations.

There is an ELMET contact metal for every purpose

METRO-CUTANIT LIMITED GRAPPENHALL WARRINGTON LANCASHIRE

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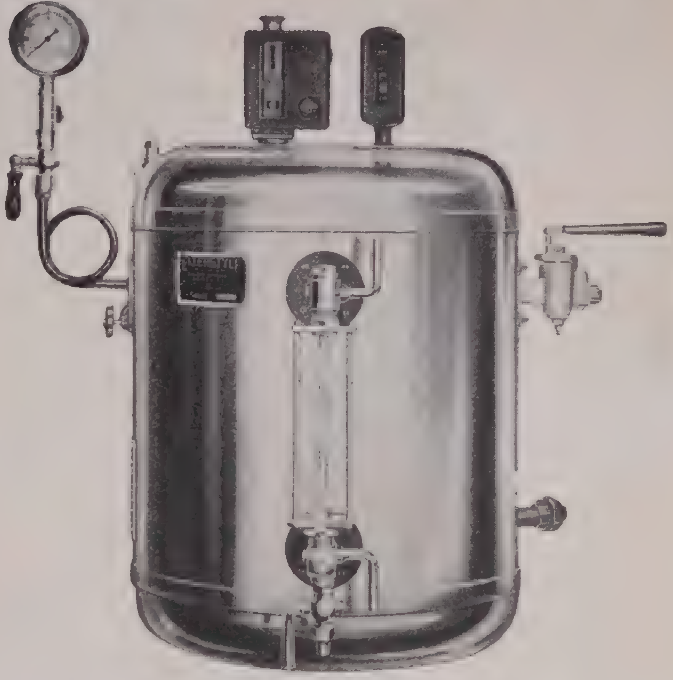
Our Boilers incorporate a Valve of unique design which we developed to provide STEAM of VARIABLE HUMIDITY.

They are fitted to thousands of Bakery Ovens and have other applications.

The compactness of design enables them to be installed where the steam is needed thereby eliminating long pipe lines.



Manufacturers:

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COLEBROOKE PLACE, ISLINGTON, LONDON, N.1
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Where Variable Humidity is required

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COMPRESSION GLANDS *for* PLASTIC CABLES

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R.H. THREAD
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NO TWISTING OF ARMOUR WIRE

NOW AVAILABLE in FLAME-PROOF PATTERN

This range is designed for P.V.C. or Polythene insulated S.W.A. and P.V.C. sheathed cables. The enclosed clamp ensures no twisting of the armouring and excellent continuity.

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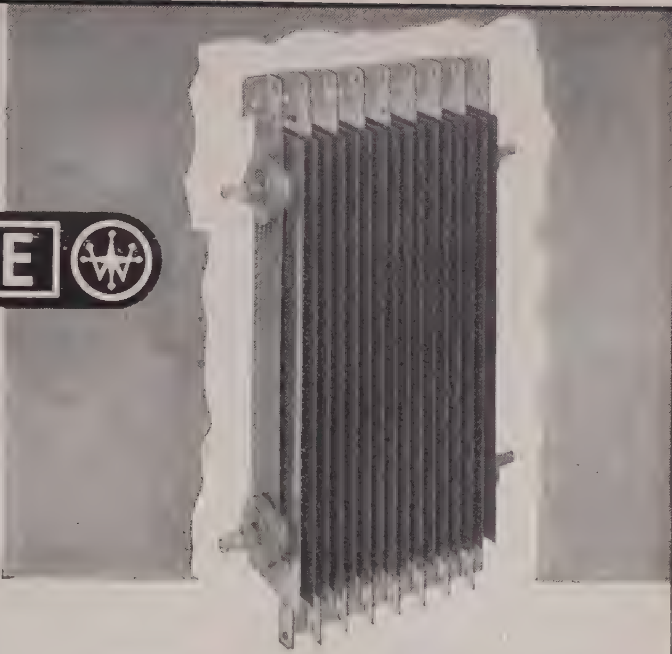
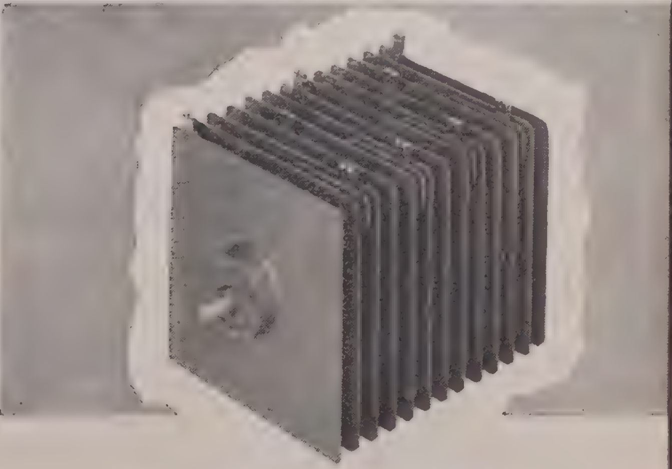
WESTINGHOUSE

POWER SELENIUM RECTIFIERS

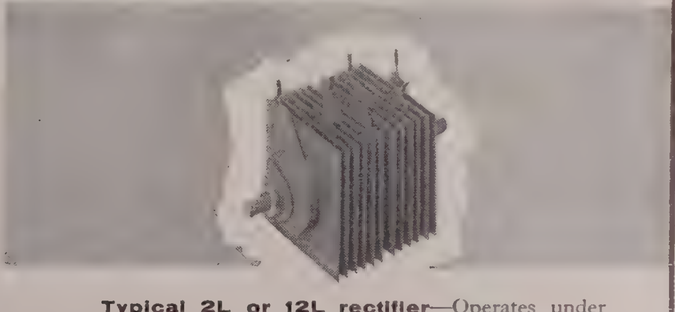
high and medium current applications



Typical 1L or 11L rectifier—This is a rectifier utilising elements size 12 in. x 3 in., used mainly for heavy current applications. It is used normally under oil, but can, of course, be used with forced-air cooling.



Typical 2AC or 12AC rectifier—From our industrial range of rectifier units of medium current capacity, with natural air convection cooling.



Typical 2L or 12L rectifier—Operates under similar conditions to the 2AC or 12AC, but is used to its best advantage under oil where the same ratings as the 2AC or 12AC units can be maintained with reduced volume. Natural and forced-air cooling can also be used.

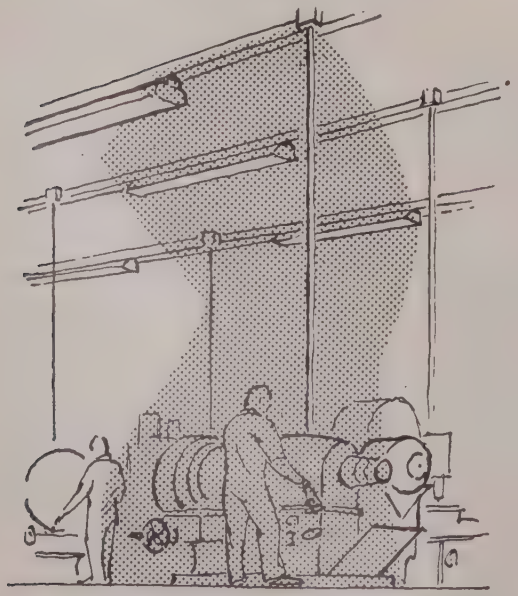
Please write for details
Dept. ER 12, Rectifier Division

WESTINGHOUSE BRAKE AND SIGNAL CO., LTD., 82 York Way, King's Cross, London, N.1
Tel: TERminus 6432

★ add Crompton *'Power-Line'*

Fast-installation power trunking readily adapted to new needs

★ ★ ★



- ★ 'Power-Line' trunking can be quickly added to one or both sides of Crompton 'New-Line' lighting trunking. The only tool needed is a screwdriver. 'Power-Line' may be used alone to provide ready power to bench drivers.
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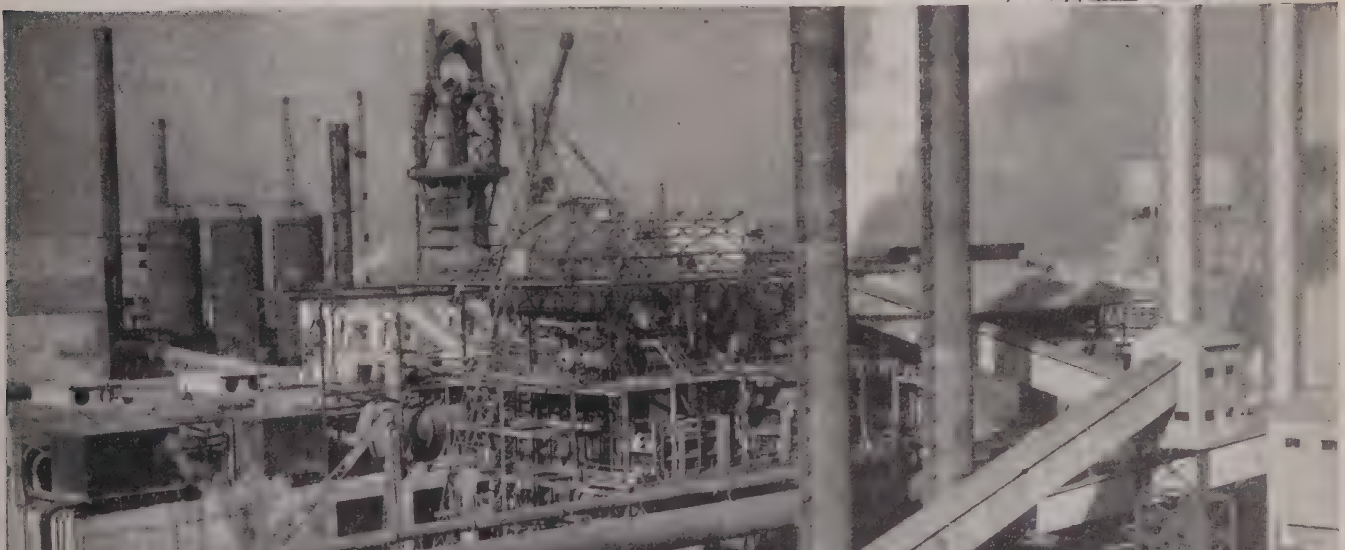

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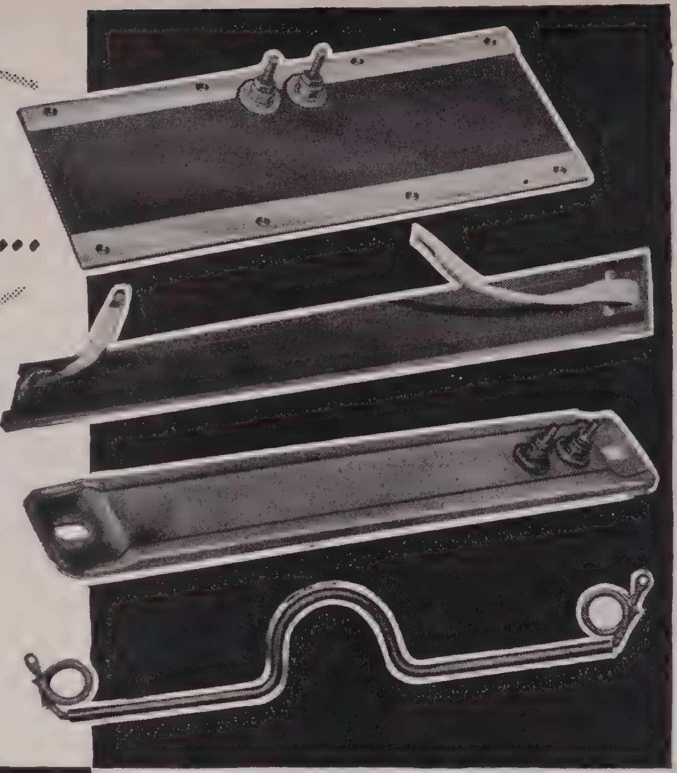

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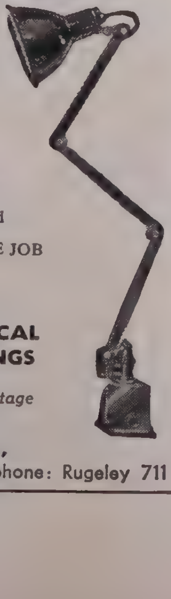

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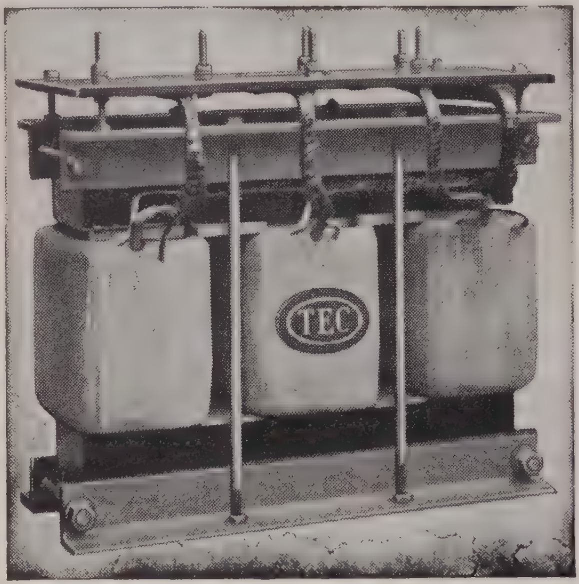

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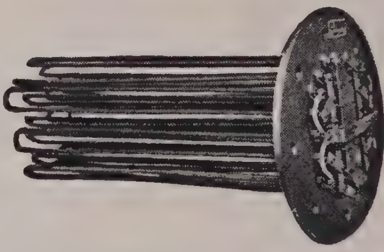

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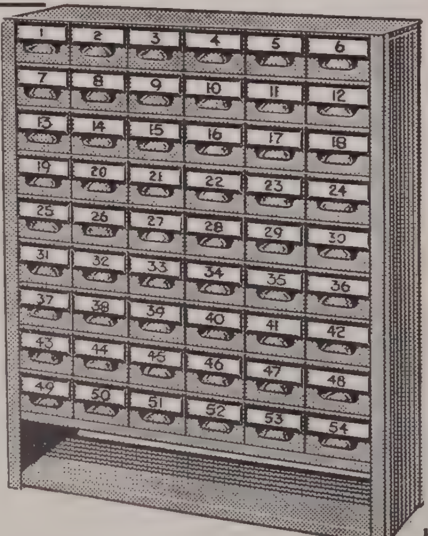

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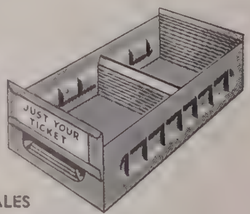

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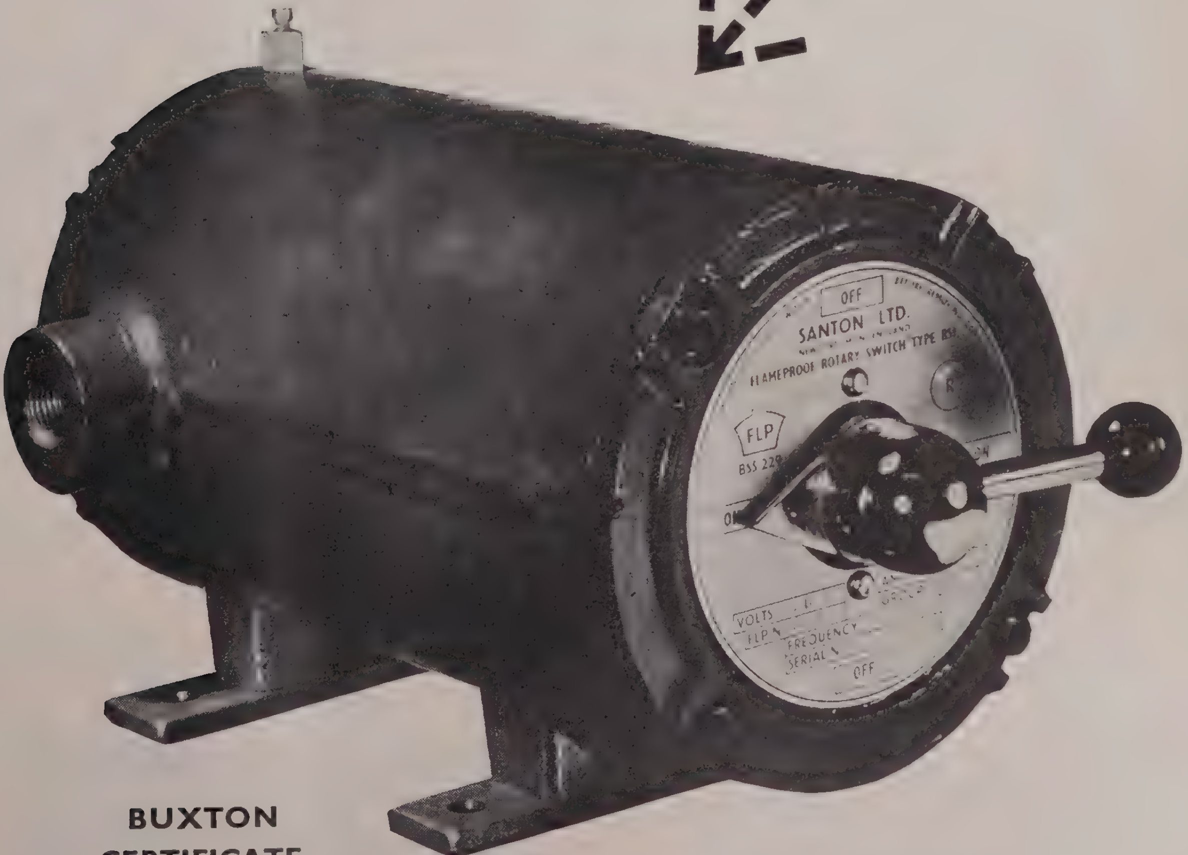

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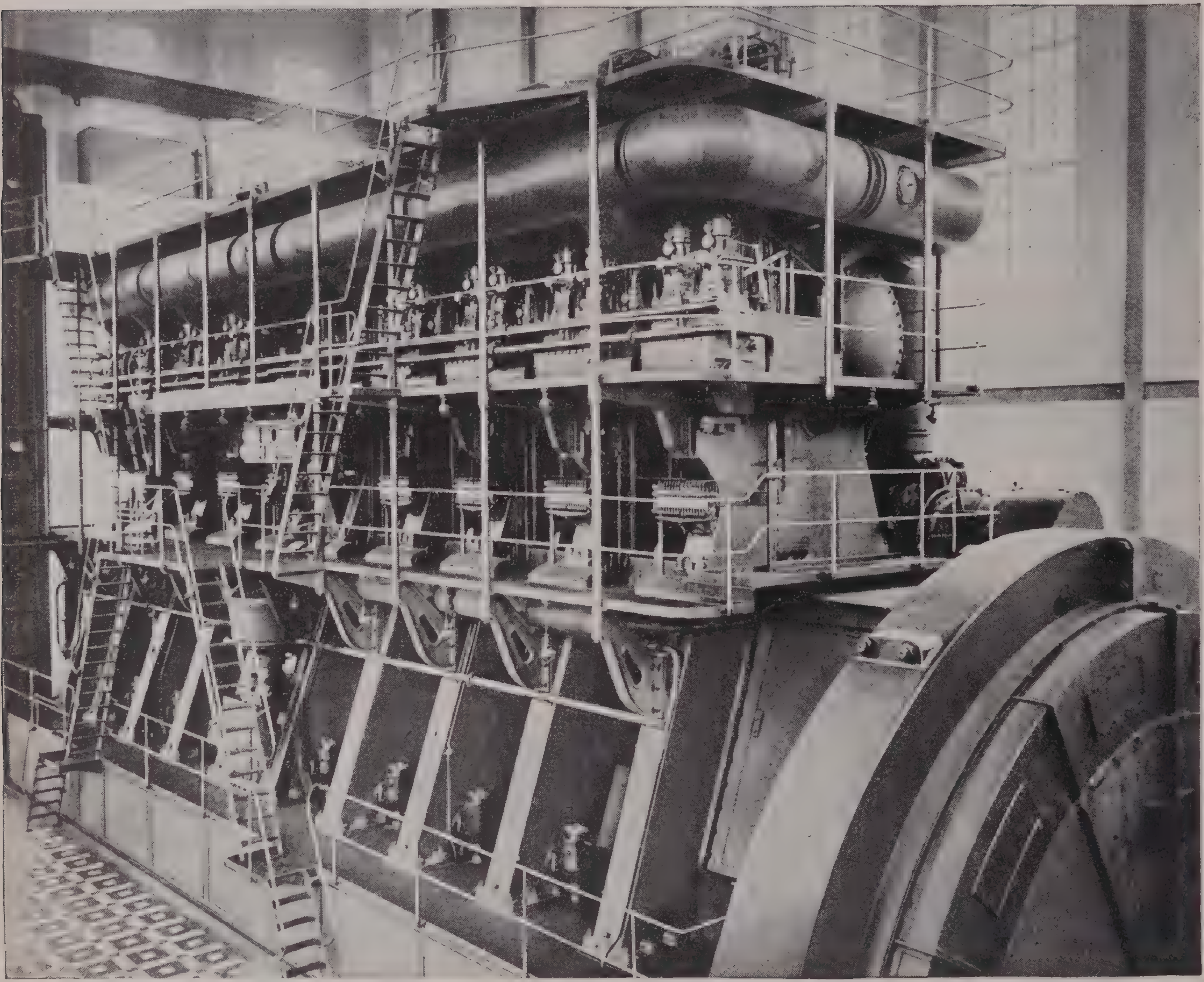

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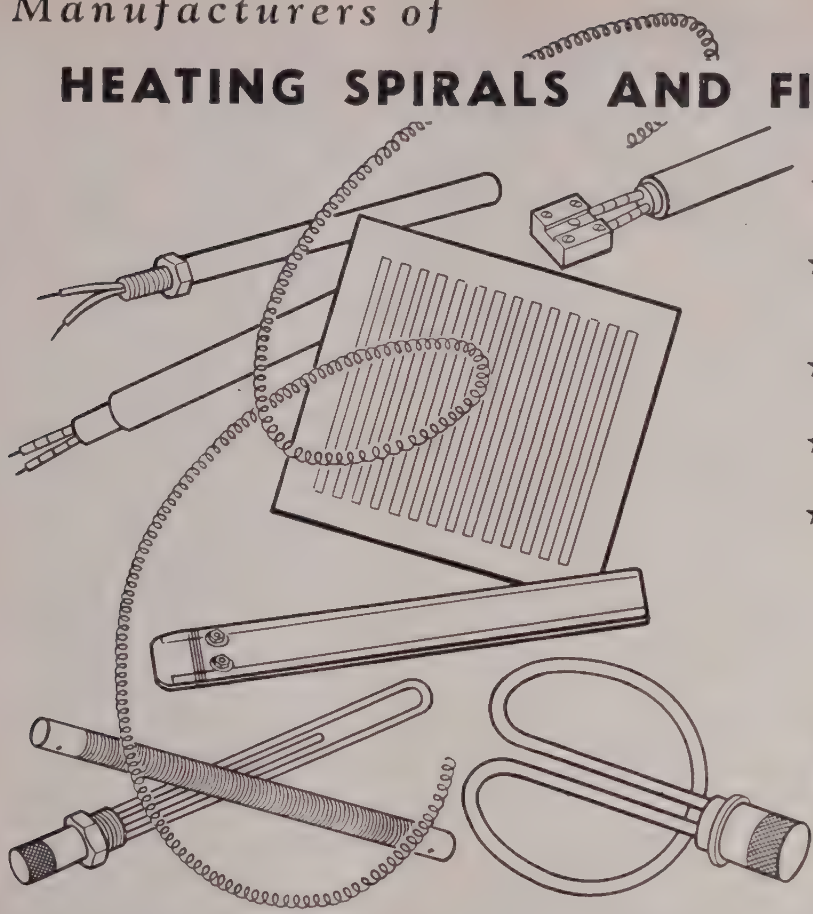

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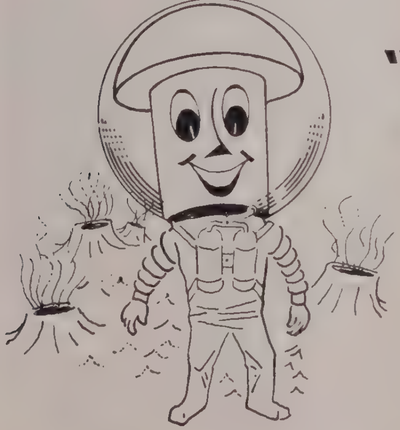

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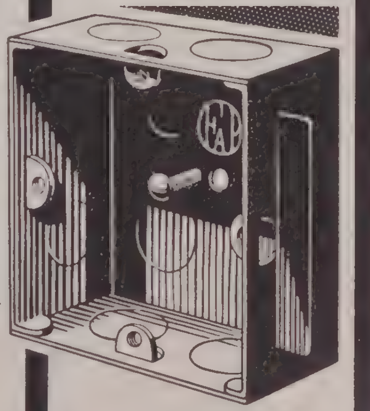

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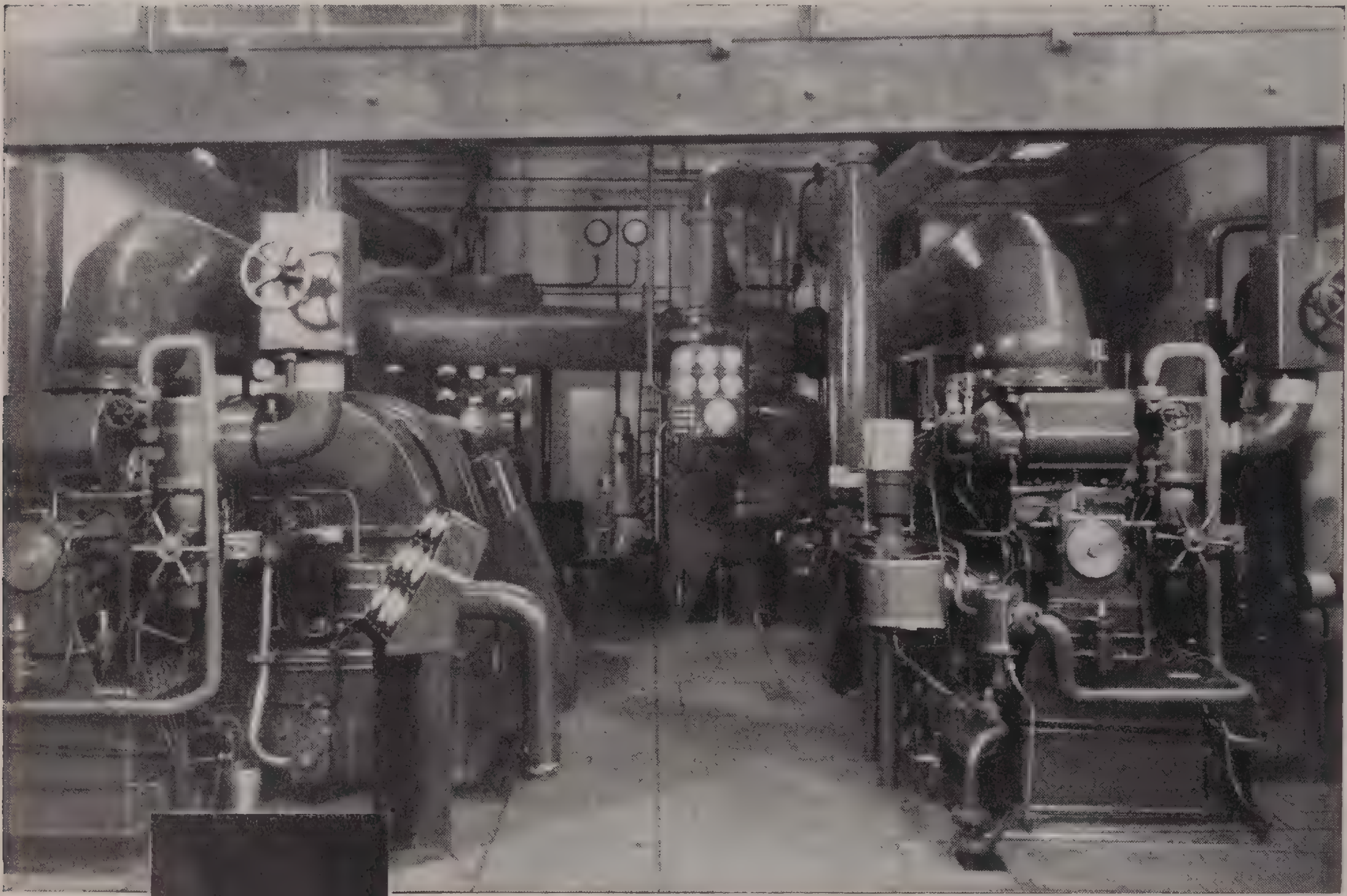

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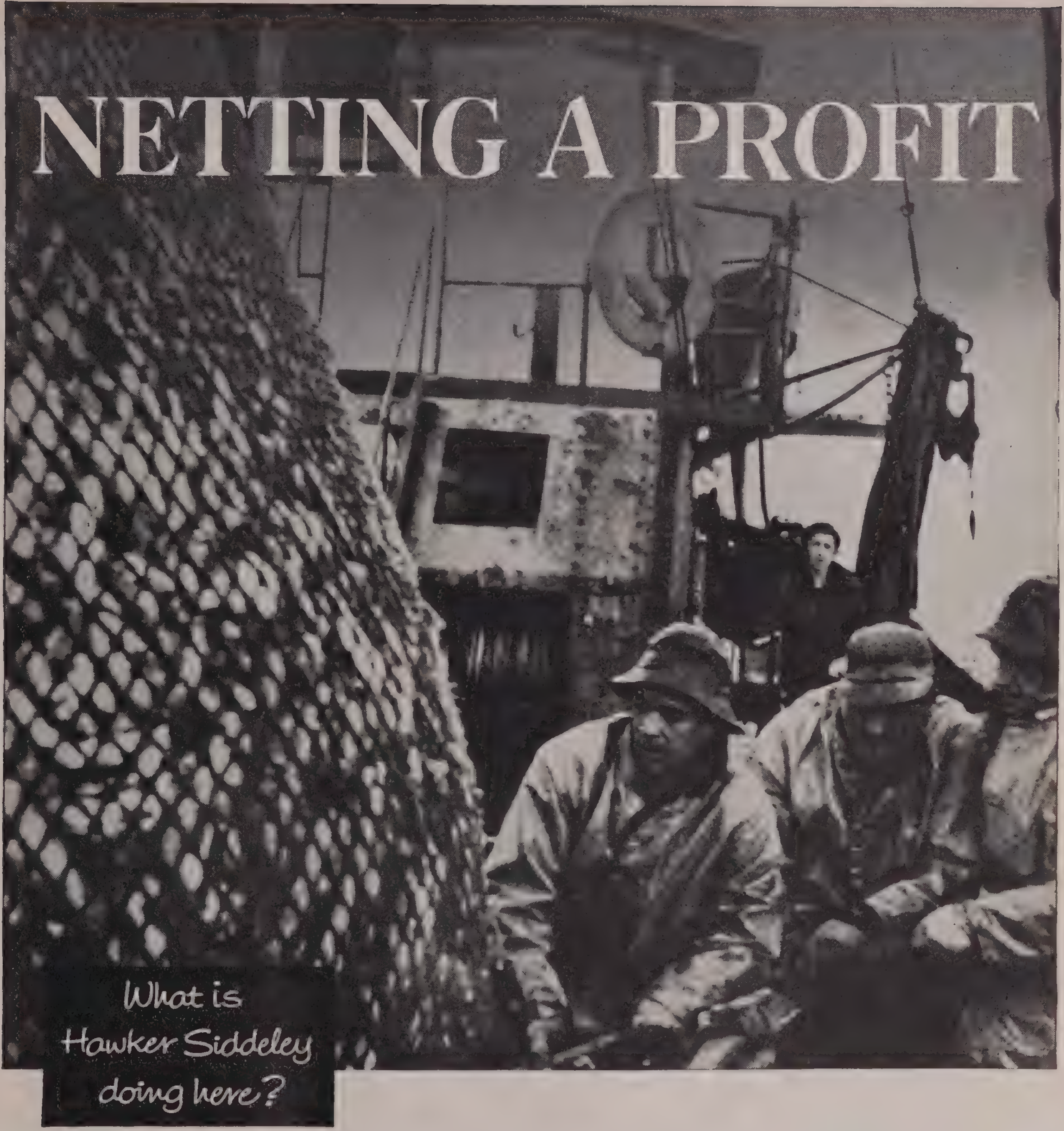
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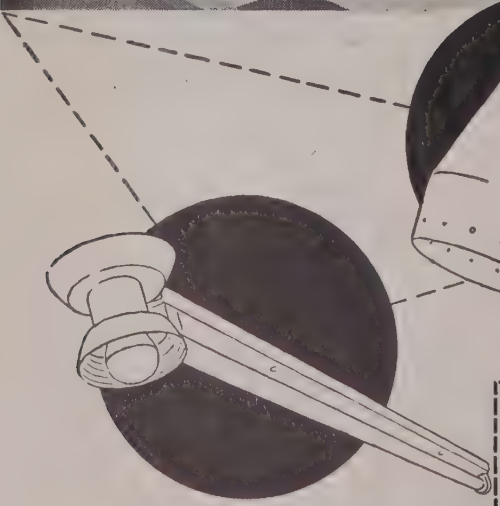

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Trolley-Bus Services at Bournemouth	1018	While some transport authorities are changing over to motor-buses, at Bournemouth the trolley-bus system is not only being continued but extended. This article by the general manager of the Corporation Transport Department shows that trolley vehicles are ideal for fixed city routes

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ELECTRICAL REVIEW

27 May 1960 Vol. 166 No. 22 Established 1872

Case for the Convention

EACH year as the British Electrical Power Convention becomes imminent we are questioned about its purpose; if it is fulfilling that purpose; and whether it should be continued. At the first Convention in 1949 Lord Citrine, who was largely responsible for this re-birth in a new form of the I.M.E.A. Convention, was president. Quoting the rules of the new organisation, he said that the objects were to promote the common interests of the organisations engaged in the industry, to foster the maximum degree of co-operation between the various sections, and to encourage and develop good relationships within the industry. He went on to say:—

> " To some it might appear that the interests of the different bodies represented in this Convention must lead them in different directions. I believe that would be an entirely erroneous conclusion. However the various occupational and trading interests of the bodies represented in this Convention may differ, our basic interest lies in the prosperity of the electrical power industry and that prosperity can be achieved only in the measure that it provides an efficient and satisfactory service to the consumer."

That remains the purpose of the Convention and it is fulfilled in two principal ways: by the presentation and discussion of papers recording progress in the electrical industry and pointing the way to the future; and by social gatherings, in general assembly or in smaller groups. We sincerely believe that success has been achieved. In no other industry do more cordial relations subsist between the various sections and we attribute this spirit to a very large degree to the Convention.

Having thus served its purpose can the Convention now be ended or suspended? The answer is that good relations, once established, must be fostered, and new people come forward each year. As Samuel Johnson put it: " A man, Sir, should keep his friendship in constant repair." To abandon the Convention now, or even to make it biennial as has been suggested, would be to throw away or diminish the goodwill engendered during the past twelve years. We share the opinion of most of the responsible leaders of the industry that this would be calamitous and we look forward to the maintenance of the Convention as a permanent institution.

That is not to say that we regard the present form as perfect. There are certain ways in which the Convention could be improved and strengthened but this can await later discussion. Our present purpose has been to remind our readers, whether delegates or not, that the Convention is an influence for good and of ultimate benefit to all in the industry.

B.E.P.C. PRESIDENT

The Rt. Hon. the Viscount Chandos, P.C., D.S.O., M.C., this year's President of the British Electrical Power Convention, has been prominent in public affairs for many years. He was educated at Eton and Trinity College, Cambridge, and served with distinction in the Grenadier Guards during the 1914–18 war. He later became managing director of the British Metal Corporation, Ltd., and in 1939–40 was Controller of Non-Ferrous Metals.

Lord Chandos, then Capt. Oliver Lyttelton, entered Parliament as member for Aldershot in 1940 and the same year became President of the Board of Trade. He was subsequently Minister of State in the Middle East and a member of the War Cabinet, and Minister of Production. Then from 1945 to 1951 he was chairman of Associated Electrical Industries, Ltd., but relinquished that position in 1951 upon becoming Secretary of State for the Colonies. When he gave up that Ministry in 1954 he was created a viscount and he rejoined A.E.I.

Among his many other public activities Lord Chandos is president of the Institute of Directors, chairman of the Advisory Development Council for Northern Ireland, a trustee of the National Gallery and of Churchill College, Cambridge, and he is president of the Locomotive & Allied Manufacturers' Association of Great Britain for 1960.

Photograph by Antony Armstrong-Jones

SATISFACTORY PASSENGER TRANSPORT

Electrical people who have previously visited Bournemouth will not have failed to notice the fine trolley-bus system in the Borough. As the Bournemouth Council is taking delivery of new trolley-buses and, within the next twelve months, will have renewed most of its fleet, the Power Convention provides an opportunity for an article in this issue on the town's trolley-buses. The Council considers that to abandon trolley-buses in favour of oil-engined vehicles would really be a retrograde step. Happily there are some other councils and their transport managers who hold the same sound views.

What has given victory to oil buses on too many occasions? This vehicle has its place in transport but so, undoubtedly, has the trolley-bus. The reasons invariably given for the so-called superiority of the oil bus in towns are plausible but do not stand close study and analysis. Undoubtedly commercial pressure, in which both the motor vehicle and oil industries are heavy weights, has often been exerted.

STANDARDS ENGINEERS

The attendance at the recent sixth Standards Engineers' Conference in London was over 250 and many others were turned away. At such a large one-day conference only a few people can hope to express their views and much time was necessarily given to discussing topics which, though interesting, were of little practical help to individuals. The main difficulty, yet to be fully overcome, is convincing management that standards departments are necessary. Not only was the conference confined to standards engineers but they all came from firms who were already operating a standards department. Any propaganda was therefore wasted. There was, however, one result which made the conference worth while. It was unanimously decided to accept a proposal designed to meet the desire to form an association of standards engineers. Under this proposal, standards engineers could become special associates of the British Standards Institution. It was felt that another "splinter group" would not be appropriate and the temptation has, we hope, been finally resisted.

"UNOFFICIAL" ACTION

A circular sent by the Executive Council of the Amalgamated Engineering Union to its local officials deprecating stoppages, overtime bans and other forms of action taken without the Council's approval has been taken as an attempt to curb the freedom of the Union's representatives. Writing in the May number of the *A.E.U. Journal*, the president (Mr. W. J. Carron) says that it is no such thing.

> "Rules are made in the name of the union as a whole by the representatives of all the membership. There can therefore be no licence to break them as and when it suits a particular member or groups of members, whether they may be officials or not. . . . Under our constitution for every aggrieved member there is a procedure to protect his or her rights and for every difference with an employer there is a procedure which can lead to a decision. Our union will maintain its high standing only if it keeps its agreements and it will conserve and wield its full strength by not fragmentising its efforts in bouts of unofficial origin."

This needed saying—and it needs saying by the heads of other trade unions. Local direct action, possibly spreading to whole areas, is becoming a little too frequent nowadays.

After an interval of eight years the British Electrical Power Convention next week returns to Bournemouth for its 12th annual meeting, under the presidency of the Rt. Hon. Viscount Chandos, P.C., D.S.O., M.C., chairman, Associated Electrical Industries, Ltd. The Convention proceedings will take place in the Pavilion and will have as their theme "The New Horizon," upon which there will be four papers dealing with electrical manufacture, electricity supply, electrical export and electricity in the home, respectively. In addition to the presentation and discussion of the papers, the proceedings will include the annual dinner, the popular "Electrical Forum" and the annual general meeting. More than 2,000 delegates representing all the principal organisations of the British electrical industry are expected to attend and full details of the programme and the Convention membership are given below

THE NEW HORIZON

CONVENTION PROGRAMME

MONDAY, 30th MAY

3 p.m. Pavilion. Opening of the Convention and Civic Welcome by the Mayor of Bournemouth. Presidential address by Lord Chandos.

8 p.m. Pavilion Ballroom. Reception by the Mayor and Mayoress of Bournemouth, followed by dancing.

TUESDAY, 31st MAY

9.30 a.m. Pavilion. Paper, "The New Horizon—Electrical Manufacture" by the Hon. H. G. Nelson, M.I.C.E., M.I.Mech.E., M.I.E.E., managing director, English Electric Co., Ltd. Discussion.

12.15 for 12.45 p.m. Pavilion Ballroom. Luncheon organised by the Electrical Association for Women.

2.45 p.m. Pavilion. Paper, "The New Horizon—Electricity Supply" by C. R. King, C.B.E., Companion I.E.E., M.Inst.F., chairman, Electricity Council. Discussion.

WEDNESDAY, 1st JUNE

9.30 a.m. Pavilion. Paper, "The New Horizon—Electrical Export" by E. V. Small, chairman of the Export Panel, British Electrical and Allied Manufacturers' Association, and joint managing director, Associated Electrical Industries Export, Ltd. Discussion.

10.30 a.m. Royal Bath Hotel Ballroom. Ladies are invited to take coffee with Lady Chandos.

1 p.m. Popular Restaurant, Pavilion. Rotary Club Luncheon.

2.45 p.m. Pavilion. Paper, "The New Horizon—Electricity in the Home" by T. E. Daniel, M.Eng., M.I.Mech.E., M.I.E.E., past-chairman, E.D.A., and chairman, North Western Electricity Board. Discussion.

7 for 7.30 p.m. Pavilion Ballroom. Annual Dinner. Principal guest, the Marquess of Salisbury, K.G., P.C., F.R.S. To be followed by cabaret and dance (10.30 p.m. approx.).

THURSDAY, 2nd JUNE

10 a.m. Pavilion. Electrical Forum. The panel will consist of Miss Mary George (director, Electrical Association for Women) Mr. A. R. Cooper (member for operations including nuclear and personnel, C.E.G.B.), Mr. N. Elliott (chairman, South Eastern Electricity Board) and Mr. S. F. Steward (director, B.E.A.M.A.).

12 noon. Pavilion. Annual General Meeting.

MEMBERSHIP

Association of Consulting Engineers.
British Electrical and Allied Industries Research Association.
British Electrical and Allied Manufacturers' Association.
British Electrical Development Association.
British Industrial Measuring and Control Apparatus Manufacturers' Association.
British Lighting Council.
British Refrigeration Association.
British Valve Manufacturers' Association.
Cable Makers' Association.
Central Electricity Generating Board.
Douglas Corporation Electricity Undertaking.
Eastern Electricity Board.
East Midlands Electricity Board.
Electric Lamp Industry Council.
Electric Light Fittings Association.
Electric Vehicle Association of Great Britain.
Electrical Association for Women.
Electrical Contractors' Association.
Electrical Contractors' Association of Scotland.
Electrical Wholesalers' Federation.
Electricity Council.
Electricity Undertakings in Northern Ireland.
Institution of Electrical Engineers.
Isle of Man Electricity Board.
Jersey Electricity Company Limited.
London Electricity Board.
Merseyside and North Wales Electricity Board.
Midlands Electricity Board.
National Inspection Council for Electrical Installation Contracting.
North Eastern Electricity Board.
North of Scotland Hydro-Electric Board.
North Western Electricity Board.
South Eastern Electricity Board.
South of Scotland Electricity Board.
South Wales Electricity Board.
South Western Electricity Board.
Southern Electricity Board.
Staff Associations' Committee.
States of Guernsey Electricity Board.
Water-Tube Boilermakers' Association.
Yorkshire Electricity Board.

THE BOURNEMOUTH SUB-AREA

By T. WHITEHOUSE, A.M.I.E.E., M.B.I.M.*

The development of domestic, commercial and industrial loads in the Sub-Area is reviewed and the methods employed to satisfy this increase in demand are surveyed. The use of mobile v.h.f. radio by maintenance and service staff and developments in the use of electricity in agriculture and off-peak supplies are described

THE Southern Electricity Board's Bournemouth Sub-Area covers 2,174 square miles and its extent is shown in Fig. 1. There are six Districts—Bournemouth, Lyndhurst, Salisbury, Southampton, Weymouth and Yeovil—organised on a "single-headed" system with a district manager responsible to the Sub-Area. Yeovil District is the largest in area (632 square miles) but Bournemouth, with an area of 345 square miles, has the largest number of consumers, namely, 125,029, and a demand of 180 MW. At 31st March last there were 367,748 consumers in the Sub-Area classified as shown in Table 1.

Domestic Load

In recent years there has been a considerable development of the domestic load in the Sub-Area, particularly in the Bournemouth, Southampton and Lyndhurst Districts. Bournemouth itself is a very popular residential area, and there is little land remaining for develop-

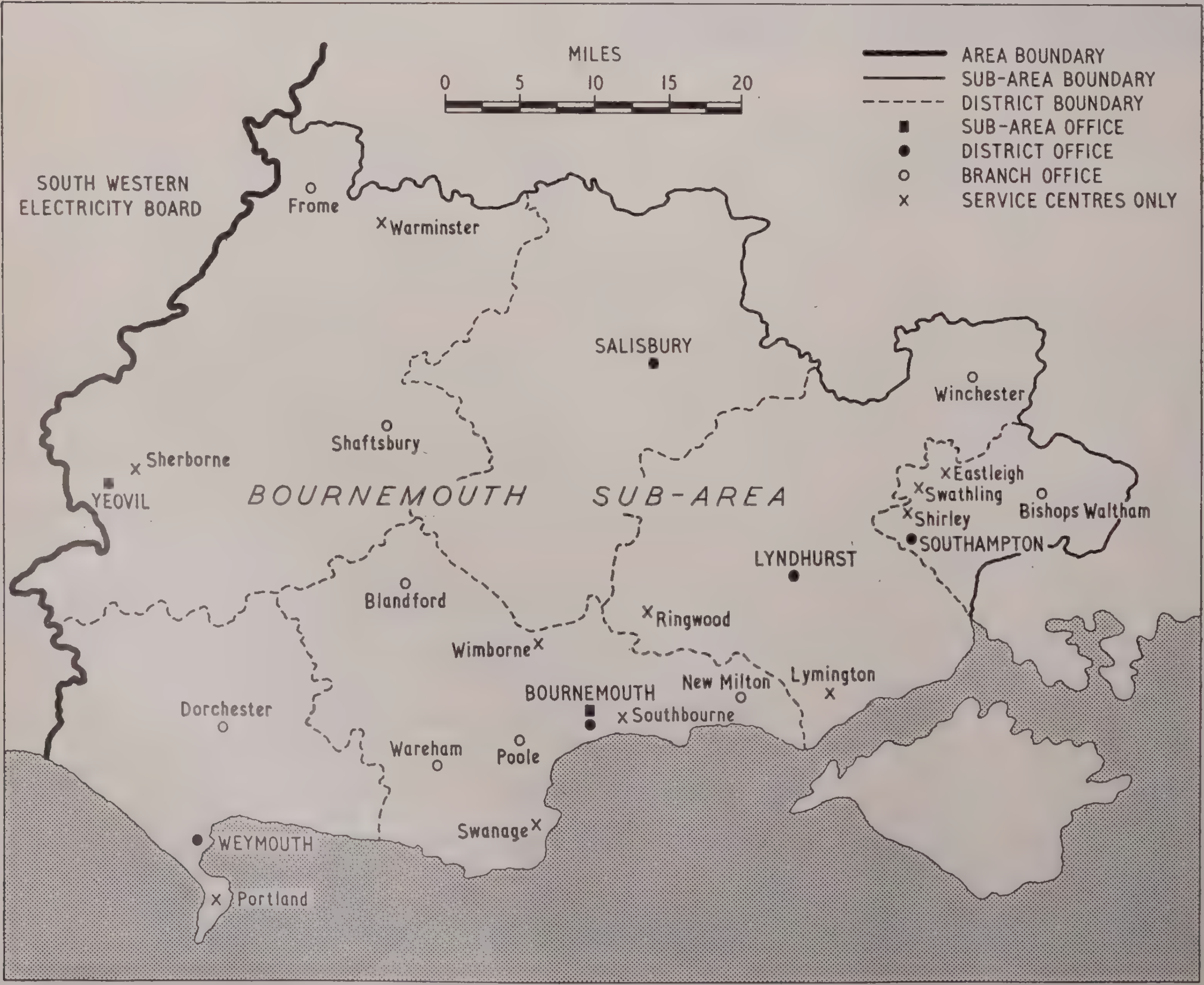

Fig. 1.—Map showing extent of the Bournemouth Sub-Area

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* Manager, Bournemouth Sub-Area.

Left: Esso Refinery, Fawley, by night

Below: 16-storey block of Corporation flats in course of erection, Southampton

ment. A result has been that some of the larger houses are now disposing of their available ground for further private house development and several blocks of flats are being built on sites cleared by the demolition of existing large houses.

Councils are also building flats to house their tenants. Following slum clearance in Poole, supply was connected on 30th January last to the first block of 50 flats for the Corporation. A total of 1,200 flats is to be constructed over the next 15 years. The first block is all-electric with approximately 3 kW of floor warming in each flat and a 30 gal storage type water heater. At the moment, the tenants are individually responsible for the floor warming, but can make a voluntary weekly payment towards the cost of it which is collected with the rent. Supply for the floor warming is charged on an off-peak tariff without a mid-day boost.

Southampton Corporation are also building multi-storey blocks for their tenants, and the first 16-storey block of 60 flats is now under construction. Ultimate plans are for 56 blocks comprising 1,167 flats, scheduled for completion in the next three to five years. The first block will again be all-electric with approximately 3 kW of floor warming per flat. It is interesting to note that on the recommendation of the Board, the Corporation have accepted "landlord control" for the floor warming, the cost of which will be included with the rent. Here again, supply will be charged on an off-peak tariff.

TABLE I.—CLASSIFICATION OF CONSUMERS AND ELECTRICITY SALES

Class of Consumer	No. of Consumers	kWh sold in 1959/60
		millions
Domestic	319,466	695·4
Farms	8,608	71·4
Commercial ...	30,751	227·1
Combined Domestic and Commercial	6,262	37·2
Industrial	2,660	802·9
Public Lighting ...	—	13·0
Traction	1	7·2
Totals ...	367,748	1,854·2

Commercial Load

There is a considerable commercial load in the Sub-Area, particularly in Bournemouth and Southampton. The centre of Southampton suffered through bomb damage during the last war, and in recent years the main shopping area in the vicinity of Bargate has been reconstructed on modern lines with large shops and self-service stores.

In 1958 Southern Television set up their studios in Southampton and now take a supply of 500 kVA capacity. Extensions have also been made to the University and new hostels for the students will have electric floor warming.

Industrial Load

The largest industrial consumer in the Sub-Area is the Esso oil refinery at Fawley, in the Lyndhurst District. This is the largest refinery in the Commonwealth and the ninth largest in the world, representing nearly one-third of the refinery capacity in the United Kingdom. Nearby are the new factories of the International Synthetic Rubber Co., Ltd., Monsanto Chemicals, Ltd., and Gemec, Ltd.

The British Transport Commission take a supply for Southampton docks, and British Railways for their works at Eastleigh. Pirelli-General have factories producing cable at both Southampton and Eastleigh. Car bodies are built for the Ford Motor Co. at Eastleigh, and Wellworthy, Ltd., take a supply for their factories at Salisbury, Ringwood and Lymington. Industrial consumers in the Salisbury District also include Witchampton Paper Mills.

The War Department, in addition to their own generation at Ratfyn, take a bulk supply from the Board which is distributed through their own network. The Ministry of Aviation take a supply at Hurn Airport, which is now being redeveloped, and the Ryvita Co., Ltd., have an all-electric factory at Poole with ovens varying in size from 500 to 700 kW. For the Bournemouth trolley-buses there are eight substations in various parts of the

TABLE 2.—MAINS AND DISTRIBUTION EQUIPMENT

Year	Cable (Miles)			O.H. Lines (Miles)			Substations		Consumers
	33 kV	11 to 2 kV	L.V.	33 kV	11 to 2 kV	L.V.	H.V./H.V.	H.V./L.V.	
1949/50	39	628	1,461	228	1,030	1,103	101	2,784	
1950/51	39	655	1,490	244	1,154	1,207	101	3,077	266,783
1951/52	40	676	1,520	254	1,214	1,258	109	3,266	277,214
1952/53	50	685	1,548	369*	1,280	1,316	118	3,496	287,292
1953/54	51	717	1,573	380	1,350	1,359	121	3,737	299,598
1954/55	62	744	1,618	398	1,462	1,420	122	4,164	312,863
1955/56	66	769	1,672	405	1,575	1,487	120	4,565	325,264
1956/57	66	796	1,715	421	1,682	1,539	121	4,967	335,631
1957/58	69	831	1,759	453	1,789	1,597	123	5,403	345,254
1958/59	71	867	1,818	466	1,911	1,647	128	5,885	356,342
1959/60	71	909	1,885	488	2,045	1,682	137	6,439	367,748

* 72 miles of 33 kV lines taken over from Central Electricity Generating Board.

town. Supply is metered at 11 kV and then transformed and rectified to 550 V d.c. [See the article on page 1018.]

The Admiralty are supplied at Portland Naval Dockyard and also at the Royal Naval Air Station at Yeovilton. The United Kingdom Atomic Energy Authority now take a supply at the new research establishment at Winfrith, in Dorset, where the "Dragon" international high-temperature gas-cooled reactor (H.T.G.C.) project is being undertaken. Westland Aircraft, Ltd., have a large factory in Yeovil building helicopters. Wellington Weston & Co. have a factory at Frome producing plastic equipment and the B.B.C. a transmitting station at Rampisham.

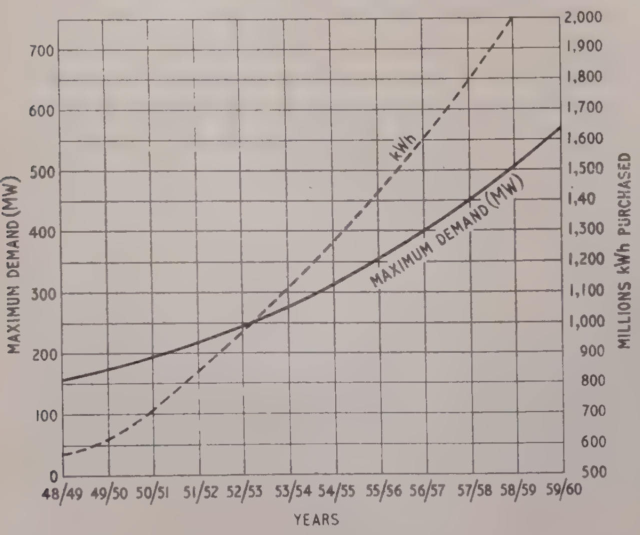
Showrooms

The Bournemouth District showrooms are situated in Yelverton Road and there are branches in Parkstone, Blandford, Wareham and New Milton, with additional service centres at Southbourne, Wimborne and Swanage. Premises have recently been obtained in Poole and Upper Parkstone for new service centres, which will be opened in August of this year, and it is hoped to establish a further service centre at Christchurch early in 1961.

Distribution

The rate of increase of load has been reflected in the mains and distribution equipment required to meet the demand and is summarised in Table 2. The transmission system has become inadequate with increasing load and this situation has been met by establishing bulk supply points to give a firm source, the original 33 kV system being opened between the bulk supply points.

Fig. 2.—Graph showing maximum demand (MW) and kWh purchased



Since vesting day the mean annual increase in maximum demand and kWh has been approximately 12 per cent (see Fig. 2), and this has necessitated an increase in the number of 132 kV bulk supply points from four in 1948 (together with five 33 kV supply points) to 18, including two now under construction.

The standard transmission voltage is now 33 kV, with 33/11 kV substations of 20 MVA maximum capacity in urban areas. Rural loads have increased to such an extent that 5 MVA is considered to be the minimum when purchasing new transformers. Fault power available at modern grid sources is such that 11 kV, 250 MVA equipment is standard and some older switchgear has been rendered non-automatic to meet this requirement. The size of outgoing 11 kV feeder cables has had to be increased to meet thermal rating demands under short-circuit conditions.

In the coastal belt, which covers a large part of the Sub-Area, increased difficulty is being encountered in the erection of overhead lines, resulting in delays, particularly in major reinforcement and in providing new supplies. Growing objection is also being met in the obtaining of substation sites, which are necessary to meet the rapid rise in demand and for close control of voltage at the consumers' terminals. The latter has been greatly emphasised by the provision of two television stations in the Isle of Wight.

In the large rural overhead networks of the Sub-Area, lightning is a considerable hazard, and extensive applications of auto-reclose mechanisms on 33 kV and 11 kV circuit-breakers have been made, together with the provision of pole-mounted auto-reclose switchgear in selected positions. The experience obtained with these equipments has been very favourable.

The major part of the Sub-Area is now supplied at 240 V, but there still remain a large number of 200 V consumers in the Bournemouth and Southampton urban areas; there are also d.c. consumers in Southampton and Weymouth with isolated instances in Bournemouth and Yeovil Districts.

In the urban area of Bournemouth and Poole, distribution was for many years by 2 kV single-phase cables feeding a three-wire 200/400 V network. This has been reinforced by 11 kV and 33 kV overlaying systems, but there is no economic or technical justification for replacing the single-phase l.v. networks by standard three-phase systems. It is, however, hoped to make an early start on standardising the voltage of the l.v. network in Bournemouth and in Southampton.

Nearly all engineering work is carried out by direct labour, the exception being that of steel tower lines and the bulk of civil engineering work, which is carried out under contract. The maximum possible use is made of mechanical aids in all fields of operation.

Mobile V.H.F. Radio Scheme

Five years ago it was decided to install a pilot mobile radio scheme to be tried for two years. Lyndhurst District, in the New Forest, was selected for the test and

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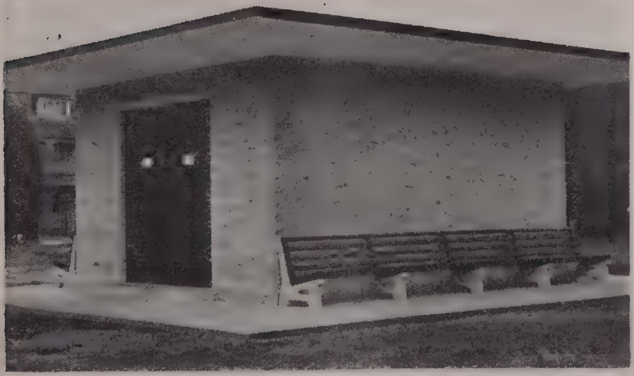

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1.—Southampton Ocean Terminal, Southampton Docks. 2.—Salisbury Cathedral floodlit, 1958. 3.—Special design of substation to requirements of Bournemouth Corporation. 4.—The Atomic Energy Establishment, Winfrith, showing the halls housing NERO and ZENITH. 5.—Typical outdoor substation it proved to be a most fortunate choice, as experience had shown that during severe storms the public telephone system was as vulnerable to damage as the Board's overhead distribution system. The original installation comprised a base station situated at the District office at Malwood, Minstead, and nine mobile stations, four in engineers' cars and the remainder in maintenance vans and lorries.

So successful did the scheme prove that in 1958 it was decided to equip the whole of the Sub-Area and there are now six base stations and 93 mobile stations in operation on a common frequency. Of these, three stations in Salisbury District are handling consumers' service for the commercial department as a further experiment.

Agricultural Development

There are 9,800 farms in the Sub-Area, of which 87·8 per cent are connected to the supply. The farming pattern varies throughout the area, ranging from small dairy farms and mixed holdings in West Dorset and Somerset, through the somewhat larger type of farm, producing a fair quantity of grain, some potatoes, beef cattle and dairy produce in Mid and North Dorset, grain and sheep on the Wiltshire downs, glasshouse crops in the East Dorset and West Hants area, with large tracts of heath and forest land mainly supporting smallholdings.

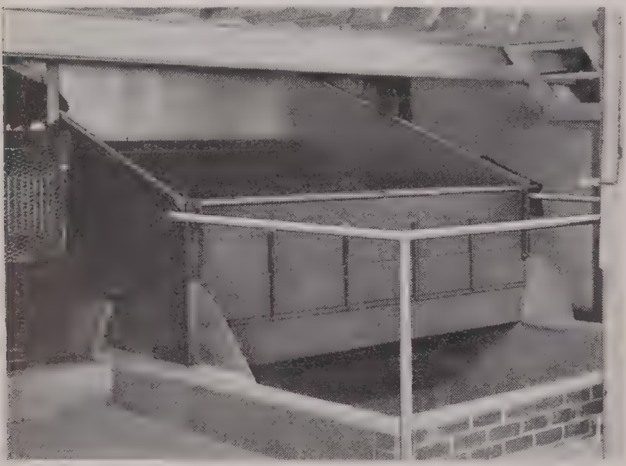

Fig. 3.—Prefabricated tray dryer on a farm near Bournemouth

Farm machinery development by the Board has changed during the last five to six years, from the dairy sterilising and water heating equipment, together with small automatic hammer mills, and a variety of pig and poultry appliances, to a greater emphasis on the design of more complex grain drying and farm food processing plants.

Until about 1955, grain drying in this Sub-Area was mainly done by the large continuous dryer (motorised and changed over frequently to automatic oil firing) and small sack platform dryers with a proportion of storage dryers in between. Recently, however, the demand for a fast batch drying system, capable of handling the output of one or more combine harvesters, has resulted in the design and installation of some 50 plants of what has come to be known as the "farm-built sloping tray dryer." The design has been developed by the Sub-Area agricultural staff, in conjunction with the N.A.A.S. machinery officers, local builders and steel firms. The result has been a cheap, effective and easy-to-handle unit, which has completely satisfied its users, and has since been made in a prefabricated form by a number of machinery manufacturers (Fig. 3).

The dryers have been constructed in sizes to take two to five tons of grain in a batch and seasonal throughputs have varied from 100 to 500 tons. The power requirement is low, as grain bed depths of only about 2ft are used, and a heater loading of 48-60 kW gives a performance of about 1 per cent moisture extraction per hour from a tray load. The heater loading is designed to give a temperature rise of 25-30°F, and off-peak tariffs for electricity are employed.

The horticulturists have been quick to see the advantage of electric soil warming when used with "mist propagation," when the loading per sq ft is increased from 5 to 15 W. Applications of light are also extending rapidly and range from broiler house illumination to extended light for cucumbers, chrysanthemums and other crops.

Off-Peak Load

There has been active development of off-peak load in the Sub-Area and it now amounts to 35 MW. This load is divided between the various classes of consumers as follows:—Domestic 1 MW; farming 7 MW; commercial 19 MW; and industrial 8 MW.

The domestic off-peak load has, of course, built up with the ever-increasing application of floor warming in new houses and blocks of flats, and the introduction by the Southern Board in 1958 of a separate off-peak tariff for domestic premises. Throughout the Sub-Area there is a total of 275 floor warming installations, representing a load of 3·1 MW, and including 222 installations in domestic premises. Floor warming has also been installed in new office blocks and the first commercial installation was at the New Docks Terminal in Southampton. Thermal storage block heaters have also been installed extensively in commercial and industrial buildings; they account for 8 MW of the present commercial off-peak load. Many water pumping stations are supplied off peak, and a recent electrification at the Otterbourne station in the Lyndhurst District has provided a further 1,250 kW of off-peak load of this type. The Pier Approach Baths in Bournemouth are heated electrically on an off-peak tariff for an installation of 1,000 kW.

Method Study

In 1958, the Board appointed two method study teams as a forward step in line with modern practice for attaining higher standards of efficiency in the execution of managerial responsibility. One of these teams is based at Bournemouth.

Since January, 1959, a number of investigations into existing functions and procedures have been carried out at Sub-Area and in each of the six Districts. Economies have been made in a wide variety of clerical and associated procedures. Savings in space have resulted from planning the most efficient and economical layout of workshops and buildings and recommendations for greater economy in the use of transport have been accepted.

[A group photograph of the principal officers of the Sub-Area appears on page 1031.]

Electricity Boards' Plans

PROMISE OF CONTINUED ADVANCE

We invited the chairmen of the Electricity Boards to say something of their distribution plans for the next two years or so as we thought that the matter would be of interest, and perhaps encouragement, to those in the manufacturing and supplying industries. All the Boards have sent contributions to this symposium and we have pleasure in presenting them below

LONDON ELECTRICITY BOARD

By D. B. IRVING

B.Sc.(Eng.), M.I.E.E.

(Chairman)

THE stimulus given each year to the growth of electricity usage by the addition of new consumers is in London rapidly diminishing into relative insignificance. Nevertheless, the requirements of existing consumers continue to show the customary steady rate of increase of about 6 per cent per annum. It is estimated that to meet the demand in the next two years six new bulk supply substations will be required, with extensions at existing points, involving in all the provision of some 300,000 kVA of main transformers. On the 11 kV and lower-voltage systems no fewer than 1,000 transformer chambers will be needed, each equipped with a 500 kVA transformer. Over 600 miles of underground cables will be laid.

Change-over will continue to be one of the Board's major activities during the next two years, when it is expected that a further 125,000 consumers will have their supplies standardised. By that time it is hoped that only about 5,000 consumers will remain on d.c. out of the 232,000 taking d.c. supplies at vesting day. There will remain also some 250,000 consumers on non-standard a.c. out of the 600,000 on such supplies at vesting day. A further £2 million will have been spent on changing consumers' apparatus.

Apart from one meter testing station still engaged on the diminishing d.c. work, the last three of the original 38 meter repair and testing stations inherited at vesting day will be closed down, completing the plan to concentrate the whole of this work in three centralised meter stations. Over the two-year period these three stations—at Fulham, West Ham and Bexley Heath—will deal with some 400,000 a.c. meters.

It is hoped also to complete the new heavy equipment store at Mitcham, which will be the counterpart, south of the River Thames, of the other main store at Brimsdown and will enable the stores reorganisation to be completed throughout the Area.

It is intended to intensify our efforts to develop summer loads and, in particular, domestic water heating, as well as all-the-year-round domestic loads such as cooking. Thermal storage night load will also be given particular attention, and it is expected that some 3,600 dwellings with an installed floor warming load of 15,000 kW will be completed during the next two years. By that time it is hoped that the sales per domestic consumer will be of the order of 2,200 kWh per annum.

Two new showrooms will be opened and some existing showrooms will be re-sited under development schemes. Substantial modernisation will also be carried out at several of the older showrooms.

In meeting the programmes outlined above, the education and training of competent staff must play a prominent part, and to this end the Board's training establishment at Pratt Street, St. Pancras, will be utilised to the full. Not only will some 80 jointers and 100 craft apprentices be trained to play their part in the development of the distribution systems, but by the end of the two-year period a further 500 commercial staff will have taken training courses at Pratt Street to enable them to become more and more effective in helping the London public to take full advantage of the Board's electricity service.

SOUTH EASTERN ELECTRICITY BOARD

By W. R. T. SKINNER

B.Sc.(Eng.), A.K.C., M.I.Mech.E., M.I.E.E. (Deputy Chairman)

ON 1st April, 1948, "Seeboard" took over 858,660 consumers. Twelve years later, on 31st March, 1960, 1,253,430 consumers were connected to our mains, a total increase of 394,770, or 46 per cent. Additions made in individual years have varied between 27,507 and 37,716, but there is no indication of any *general*, i.e. long-term, trend in these additions, either up or down. Many of the additional connections are to new houses, but we, as an electricity supply authority, are in no position to predict how many new houses will be completed and occupied in our area, in any future period, except on the basis of what our past experience has been. On that basis, and bearing in mind the lack of any apparent general trend, the safest guess for the next two years would be the average of the last twelve, namely, some 33,000 new consumers in each year, which would bring the total to approximately 1,320,000 by 31st March, 1962.

Again, in April, 1948, we took over some 87,500 consumers who were being supplied with direct current. By 31st March, 1960, the number had been reduced to less than 12,000. The change-over programme is now drawing to its close and some progressive slowing-down in the annual rate of progress must be taken into account. I should expect that between 6,000 and 7,000 consumers will be dealt with in the year 1960-61 with a further 3,000 to 4,000 in 1961-62, leaving only about 2,000 with direct current supplies at 31st March, 1962.

In recent years we have commissioned some 600 circuit-miles of new mains of all classes, overhead and underground, high voltage and medium voltage, each year. New mains are required to deal with new business, with current reinforcement and, in present circumstances, with arrears of reinforcement. It has already been noted that, so far as new business is concerned, we expect to go forward in the next two years at about the average rate. This, coupled with the fact that the average use of electricity by our consumers increases every year and the increase shows no sign of slackening, implies that the amount of current reinforcement to be carried out in the next two years will be no less than it has been in the immediate past.

So far as arrears of reinforcement are concerned we have made progress in the last twelve years, but once arrears are allowed to accumulate it is a major and very long-term task to catch up with them again. We have not yet caught up, and it is almost certain that we shall not be able to complete our task in the next two years. On all accounts, therefore, we shall expect to be commissioning in the next two years not less than an average of 600 circuit-miles of new mains a year.

With mains must go substations and transforming points. In recent years the total number of substation and transforming points has increased very evenly by rather more than 740 a year. Of these, some 420 a year are pole-mounted transformers. A total increase over the next two years of some 650 substations and 850 pole-mounted transformers would not seem to be unreasonable guesses.

On the trading side we should expect our showroom and contracting business to be maintained or even moderately increased, provided we are left free to trade with no additional external controls.

SOUTHERN ELECTRICITY BOARD

By S. M. RIX, F.C.I.S., F.S.A.A.

(Deputy Chairman)

THE Southern Electricity Board serves an area which is attracting industry and residents at an increasing rate. The maximum demand on the Board's system has risen steadily from 1,159 MW in 1954-55 to 2,095 MW in 1959-60 and the indications are that the load will increase still more rapidly in the next few years. A great amount of leeway has still to be made up on the work of reinforcing the existing network and for this purpose many more new transforming and switching stations will be necessary. The pattern of these extensions will follow the multiple injection system, by means of which new substations will feed into the existing networks from the higher-voltage systems.

Construction of new housing in the Area continues at a high rate and it is anticipated that some 34,000 new domestic premises will be connected to the mains in 1960-61. A number of blocks of municipally-owned flats are being erected and equipped with electric floor warming, which is expected to be further encouraged by a reduction in the domestic off-peak tariffs recently announced.

The industrial load continues to grow by some 8 to 9 per cent each year in an Area which can no longer be considered predominantly agricultural and residential. Several of the towns in the Area are expanding rapidly and there is a continuing demand for more street lighting.

The demand by existing domestic consumers is also rising rapidly and it is expected that individual domestic consumer demand will rise from an a.d.m.d. of from 1 to 2 kW to from 3 to 5 kW. This appears to arise from the decline in the use of solid fuel and the ever-increasing use of domestic appliances. Television has made consumers more conscious of any voltage variations in the distribution networks where a heavy programme of reinforcement faces the Board for some years to come. The commercial load is also growing steadily. Consumers are being connected at the rate of approximately 2,000 per annum while electricity consumption continues to show an annual increase of the order of 9 per cent.

Rural development has continued steadily to the point where some 88 per cent of farms and horticultural premises are now connected; they are encouraged to use modern electrical farming equipment, with the aid of the Board's specialist service. It is hoped to connect about 500 more farms this year.

To deal with all these problems there will be a steady addition to the number of bulk supply points at which supply is taken from the grid, and continuing extension of the high-voltage and low-voltage systems, and substations will be needed in built-up areas at intervals of 200-300 yd. Transformer sizes to supply the medium-voltage network will be increased from the average figure of 500 kVA to 1,000 kVA or even larger.

The growth in the number of consumers and the widespread demand for electrical appliances is creating the need for more showrooms and an extension of the specialist services which the Board gives to farmers and horticulturists, and of its contracting activities.

As an overall picture it can be said that the Board's construction and planning and commercial staffs will be fully occupied for some years to come, in meeting the demand, providing that the capital made available to the Board is sufficient for the purpose.

SOUTH WESTERN ELECTRICITY BOARD

By A. N. IRENS
M.Sc., M.I.E.E., J.P.
(Chairman)

THERE is an urgent need to increase the pace of work in reinforcing our existing supply system both to catch up with arrears and also to cope with the ever-growing load. At the same time, the pressure for new development in rural areas has never been heavier. In the main the limiting factor is and will be the availability of capital.

In detail it is envisaged that the next two years will see an additional 3,500 substations connected, mainly of the small rural type, but with some 500 medium-size urban pattern backed by up to thirty new 33 kV substations. In addition, forty existing 33 kV substations will be increased in capacity by the re-siting or augmenting of existing plant.

Consistent with the widespread nature of the territory and with the rural development programme, it is expected that an addition of 800 circuit-miles each year will continue, although the reinforcement required in urban areas and in particular the extensive re-cabling schemes in Torquay and Bath, will increase the underground mains content of this programme.

It is interesting to note that these attractive towns are experiencing a resurgence in load development, accentuated by the conversion of larger type houses into flats (mostly all-electric) and to their continued popularity as both holiday and residential centres. Supplies are largely given by networks and methods in vogue during the early part of the century which are now entirely inadequate for increasing loads.

Some 19,000 consumers have until recently been supplied in Torquay by a 2 kV single-phase distribution system with two- and three-core (single-phase) l.v. cables in nearly every street in the town. The reinforcement programme now in hand is being carried out in stages at an estimated cost of approximately £1½ million and involves a planned extension of 33 kV and 11 kV distribution over the town, complete re-laying of the l.v. system and conversion of consumer supplies from 400/200 V to 415/240 V three-phase.

As always, the problem of change-over and voltage standardisation demands strict scheduling and close co-ordination between engineering and commercial departments. Both load growth and limitations of summer working in this holiday town impose still closer tolerances on the working programme, but the excellent work of the District staff has led to the successful completion of the first three stages of the local ten-year programme.

With low population density throughout most of the Area we have always felt the need for higher voltages for distribution and in consequence we have an excellent coverage of 33 kV lines embracing most of our developed territory. This will be of great value in meeting forthcoming loads where already voltage drop and line loss problems are starting to take precedence over thermal capacities. Added to these are the amenity considerations which rule out a multiplicity of circuits and thus we anticipate more terminal installations of both 33 kV and 132 kV substations to meet our requirements.

EASTERN ELECTRICITY BOARD

By H. V. PUGH, A.M.C.T., M.I.E.E., M.I.Mech.E.
(Chairman)

IN making any forecast of future activities it is as well to take a brief look at the past. Ten years ago the Board's maximum demand was about 1,000 MW, whereas last winter it was 2,495 MW. During this period the Board has invested about £74 million in extensions to and reinforcement of the distribution system and has connected nearly 600,000 new consumers.

As a public service, the Board's development programme has, to a large extent, to be undertaken to enable capital works by other bodies to be brought into use, i.e. new factories, housing estates, etc., and inquiries received for industrial supplies indicate that for the next two years the present volume of business will be maintained. The latest statistics show a marked increase in the number of houses under construction in the Board's Area, as compared with a year ago, and it seems certain that the high rate of growth of load of existing consumers will be maintained.

We estimate that the number of new houses to be connected in the next two years will not be far short of 80,000. The current year—1960-61—will see the completion of the Board's present three-year programme of rural electrification and it is estimated that 86 per cent of the 32,000 farms in the Area will have a mains supply by 31st March, 1961. Provided the Board is not hampered by restriction on capital investment or in other ways the rural development programme should continue at about the same rate as at present. The Government's plans for increased expenditure on roads, schools and hospitals, etc., will also provide additional work for the Board. Provision is being made to speed up the rate of changing over to standard voltage a.c. supply the remaining 8,300 d.c. consumers and 85,000 non-standard voltage a.c. consumers in the Area.

The amount of work to be done on system reinforcement is dictated by growth of load and in many parts of the Area reinforcement is needed to relieve overload and improve voltage conditions. With the growth of load, many 11 kV and 6 kV systems are rendered inadequate and reinforcement at 33 kV has to be provided. In conjunction with the Eastern Division of the Central Electricity Generating Board, it is planned to establish new 132 kV bulk supply points and increase the capacity at a number of the existing bulk supply points.

As a result of the foregoing, the Board's plans allow for extensions and reinforcement of the system to cater for something like 110,000 new consumers and meet an increased demand of about 410 MW over the next two years. Approximately 1,000 miles of high-voltage and low-voltage cables (excluding services) will have to be laid, 1,300 miles of high-voltage and low-voltage overhead lines (excluding services) will have to be erected, and 4,000 new substations brought into commission. This is estimated to involve capital expenditure of about £21 million and will mean an enormous amount of planning and construction work, particularly in obtaining sites for substations and wayleaves for overhead lines. Schemes are also in hand for office extensions and the provision of showrooms and stores, most of this work having been deferred in past years due to capital restrictions.

All this adds up to a lot of hard work ahead, but I have every confidence in the ability of the Board's employees to carry through this programme.

EAST MIDLANDS ELECTRICITY BOARD

By N. F. MARSH

M.A.(Cantab.), M.I.E.E.

Chairman)

PROBABLY one of the biggest "headaches" that an Area Board chairman has to face each year is the capital expenditure budget. The pruning of estimates to keep within the total amount allocated and the balancing of conflicting priorities is always a delicate exercise requiring shrewd forecasting and maybe even a touch of clairvoyance.

In the East Midlands annual capital expenditure has risen from under £3½ million in the Board's first year of operations to over £7 million last year. In the early 'fifties, rural development and farm electrification was absorbing as much as 15 per cent of that total. Today, with all the villages and hamlets connected to the system and over 92 per cent of the farms already on supply, expenditure on rural development has fallen to approximately 5 per cent of the total capital expenditure.

The opportunity has, therefore, been taken to accelerate the change-over of the remaining non-standard supplies. In 1948 no fewer than 280,000 consumers, or 31 per cent of the total transferred, were receiving supplies which did not conform to the national standard. In spite of capital restrictions and other difficulties, over 41 per cent of that total have so far been changed over, and now the problem is the transfer of the remaining 160,000.

Within the next three years the change-over should be completed in all localities with fewer than 5,000 non-standard supplies. In the towns of Burton, Coventry, Derby, Nottingham and Northampton, where the situation is complicated by such factors as the replacing of extensive obsolescent mains networks, by slum clearance, rebuilding and other local authority activities and by the difficulties of finding new substation sites in heavily built-up areas, the change-over will continue for a further five or six years.

The estimated cost of carrying out the whole of the change-over programme is approximately £7 million, of which nearly £4½ million will be required on capital account for new mains and for the reinforcement of the high-voltage network, including substations. The balance of £2½ million will be spent on revenue account for changing over consumers' apparatus. To meet this increased revenue expenditure, and to help counteract the effect on revenue account of significant fluctuations in the rate of expenditure, the Board last year established a specific reserve of £250,000 for the standardisation of consumer supplies.

In some parts of the Area, particularly in the growing industrial districts in North Derbyshire, the demand is rising at over 10 per cent per annum. The engineering programme for the next two years is, therefore, a very full one and is in the main devoted to expansion and reinforcement. Forward planning to meet anticipated increase in demand includes the commissioning of three new points of supply from the 132 kV grid. These will be situated at Checkerhouse, Coventry and Hinckley. In addition, the existing grid supply points at Derby, Loughborough, East Kirkby, Winster and at Warwick generating station will be reinforced. In Leicester two miles of 132 kV cable will be laid to connect the local power station with a new main substation in the north of the city. This cable will be operated initially at 33 kV.

During the same period extensions to the Board's 33 kV and main 11 kV networks will include the construction and commissioning of 18 new 33/11 kV substations at various points in the Area and the reinforcement of 16 existing substations. In all, a further 400 MVA of main transformers will be required.

The sales of domestic appliances by the Board during the past few years have shown a gratifying increase and, provided that no artificial restrictions are imposed on this aspect of the Board's activities, the demand for domestic appliances should continue at the same high level. One of the more important developments in consumer service this year will be the opening of a new service centre in the High Street, Lincoln.

MIDLANDS ELECTRICITY BOARD

By W. S. LEWIS

C.B.E., J.P., Comp.I.E.E.

(Chairman)

CAPITAL expenditure by the Midlands Electricity Board is now of the order of £9 million annually and my view is that it will have to remain at this level if we are to meet a demand from nearly 1½ million consumers which is growing at an unprecedented rate.

We recently became the first of the Area Boards to achieve unit sales exceeding 1,000 million a month. The maximum demand of 1,125 MW in our first year (1948-49) is now exceeded on Saturday mornings, despite a five-day week in many industries, and our m.d. is now 2,511 MW. We estimate that in the next seven years the average annual increase in m.d. will be 220 MW, compared with 110 MW a year in our first seven years.

In these circumstances reinforcement of the system is now making the major demand on our capital resources, and we anticipate a need for fifteen more grid points in the next seven years, compared with nine commissioned in the last seven years, as well as increases in the capacity of fifteen existing grid substations.

Included in our £3·6 million reinforcement programme for the current year (1960-61) are new grid points at Feckenham (275/66 kV, two 120 MVA transformers), Perry Barr (132/11 kV, two 30 MVA transformers) and Black Lake (132/11 kV, two 30 MVA transformers), and the 1961-62 programme is likely to include three more new grid points at Whitfield (132/33 kV, two 90 MVA transformers), Selly Oak (132/11 kV, one 30 MVA transformer) and Shrewsbury (132/33 kV, one 60 MVA transformer). In addition, we shall be reinforcing several existing grid points, including those at Wolverhampton, Hinksford, Hereford and Summer Lane, Birmingham.

Last year (1959-60) we constructed about 1,000 miles of new mains and commissioned about 1,800 distribution substations, and much the same rate of system development is expected in the current year and in 1961-62. We shall be appreciably reinforcing the primary system and we expect to be using " packaged " 33 kV switchgear units and possibly (because of difficulty in finding sites in built-up areas) buried distribution transformers. Our engineers are considering the use of plastic cables for underground mains and we have already installed a number of trial schemes.

We recently completed our d.c./a.c. change-over programme and are now intensifying our 200-250 V standardisation effort, much of this work being in our South Staffs and North Worcs Sub-Area, which has launched a standardisation programme expected to cost £2,800,000 including change-over of consumers' apparatus. The pace of this work is limited by availability of manpower, but we are devoting £500,000 a year to it in the next two years and may reduce the planned five-year period.

Rural development, which with the full support of my colleagues I have consistently pressed forward to the maximum extent of our resources, has involved capital expenditure of about £6½ million since 1953, and it will continue to absorb upwards of £600,000 a year during the next two years, although we are now reaching the sparser and less economic areas. We have been connecting 800 to 1,000 farms annually and now have 22,100 on supply, compared with about 7,800 at vesting date. We hope to pass 85 per cent saturation in the current year (1960-61), two years ahead of the national target, and my hope is that we shall soon reach 90 per cent, as we have done already in two rural Sub-Areas, Worcester and Central Gloucestershire. Most of the remaining work is in Shropshire, Herefordshire and North Staffordshire, and while still giving priority to areas where the need is greatest, and which provide a reasonable return, as a matter of policy and in the public interest, we are including a limited number of less economic schemes.

Development and improvement of the system in both rural and urban areas is being backed by a vigorous sales effort and expenditure on new premises over the next two years will include many additions to our 140 service centres. There has been a very encouraging response from local authorities and private builders in the Midlands to our advocacy of underfloor heating and thermal storage systems, and we anticipate a considerable growth in these off-peak loads during the next year or two. Lighting authorities throughout our area also have plans which we expect will step up our current rate of about 12,500 new street lighting points connected annually.

Altogether, if nothing occurs to change the present healthy industrial climate in the Midlands, the M.E.B. will be at full stretch in the next two years keeping pace with the demand for power and for equipment.

SOUTH WALES ELECTRICITY BOARD

By W. A. GALLON

B.Sc., M.I.E.E.

(Chairman)

FOLLOWING a slight recession, industrial expansion in South Wales is again moving upwards. The oil industry is developing Milford Haven for use by large tankers; a new refinery has been built and there is an oil delivery terminal for the long-distance pumping of crude oil.

The steel industry is expanding rapidly: a new integrated works is being developed at Newport to extend, initially, to a capacity of three million ingot-tons per year with potential for double this quantity. This requires a new step-down point from the grid with 275/33 kV transformation. Other existing steelworks in South Wales are increasing their steel-making and finishing capacities, and increased output of electro-tinned sheet steel and electrical sheet steel is planned.

A great deal of work has been carried out by the coal industry in sinking new pits and redeveloping existing ones: the pattern for all these is the " all-electric " one.

In the field of appliance manufacture, South Wales is now becoming a focal point for the manufacture of refrigerators and washing machines, and there is a considerable increase of light industry on the industrial trading estates. It is probable that the motor car industry will also place a substantial portion of its expansion in South Wales. The chemical industry is also expanding, particularly in the plastics field.

There is steady expansion of domestic electrification. In 1959-60, the Board itself sold 14,000 cookers, 9,000 water heaters, 9,000 washing machines and 7,000 radiators. The institution of off-peak tariffs for floor heating is bringing in a lot of new commercial load and individual demands of 1,000 kW for department stores are not unusual. The idea is spreading to large blocks of municipal flats as well as to private development.

The rural development programme is proceeding rapidly. In the early 1950's, the percentage of farm connections in South Wales was the lowest in the country but, over the last four years, the South Wales Board has connected up more farms than any other Area Board during the same period and will complete an 85 per cent connection by 1963-64.

The pace of the work involved in dealing with all these developments can be seen from the annual construction programmes which are of the order of 850 miles of h.v. mains, 150 miles of l.v. mains and 450 MVA of transformers installed. These figures are, from past experience, likely to be repeated in each of the next two years.

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

By D. H. KENDON, B.Sc.(Hons.), M.I.E.E., M.I.Mech.E. (Chairman)

MANY times in the lifetime of the electricity supply industry the view has been put forward that saturation was approaching but history has proved this view wrong and the record of the last few years shows that the scope for still greater use of electricity is enormous and that we are nowhere in sight of saturation. We have lived through the days when it was hard to sell electricity even for lighting and very hard for purposes other than lighting, to a time when almost everyone is clamouring for more and more electricity—and we must meet this demand.

To maintain the provision of cables and substations for the new housing estates, to cope with reinforcement in the way of new substations and mains, to meet the ever-growing load and to replace obsolete equipment, there is an immense amount of work in front of us for many years to come.

During the coming two years, if the trends in recent years continue, the Merseyside and North Wales Electricity Board will have to provide for the connection of 32,000 new houses and this, coupled with mains extensions to existing houses, will add about 40,000 new domestic consumers. Following the slight recession on Merseyside in 1958, there has been a distinct upsurge of industrial activity, and the expressed intention of some large manufacturers of motor cars to build new plants in this area encourages further optimism, although it is too early to forecast the role M.A.N.W.E.B. will be asked to play in these new developments.

The Board has made, and will continue to make, substantial progress in extending electricity into the countryside and in the next two years hopes to connect more than 3,000 farms under its rural programme. At that rate of progress about 80 per cent of farms in the Area will have been connected by the end of 1962.

These developments, together with the substantial reinforcement which must take place, will entail the commissioning of over 2,000 circuit-miles of mains of all sizes, and the provision of nearly 1,000 MVA of new transforming capacity. The schemes to deal with the new business will cost about £6 million, and reinforcement will cost about £5 million, including provision for the replacement of obsolete switchgear.

M.A.N.W.E.B. also hopes to be able to do about £500,000 worth of work on d.c./a.c. change-over and a.c. standardisation. The last remaining stronghold of d.c. in the Area is in Birkenhead, and the Board plans its conversion before the end of 1962. Schemes are also proceeding as part of a programme to eliminate non-standard a.c. supplies in Wallasey.

Experience has shown that good electricity service centres pay by stimulating sales of appliances and the Board plans to continue improving existing centres and to acquire premises for several others. Since 1948, 24 new centres have been provided, making a total of 70.

The Board is devoting particular attention to the extension of uses of electricity for purposes other than motive power and this policy has been greatly facilitated by the progress made at its Industrial Development Centre. This Centre was opened in March, 1957, partly to help industrialists with their day-to-day problems, partly to learn from them the shape of their future requirements, and partly to provide a meeting ground for their experts and supply industry experts to see and discuss new developments and techniques in many spheres of industrial use. So far 17 full-scale exhibitions have been held, including exhibitions concerned with welding, high-frequency heating, space heating, electric heating in industry, surface heating, power factor correction, and a very successful exhibition connected with the Clean Air Campaign. There is scope for great expansion in the use of electricity in the chemical and glass industries and in the oil refining, steel producing and steel using industries, all of which flourish in the M.A.N.W.E.B. Area.

YORKSHIRE ELECTRICITY BOARD

By D. BELLAMY
C.B.E., D.L.
(Chairman)

THE rate of construction of additions to this Board's system has been increased substantially over the past few years in an endeavour to keep pace with the growth of our consumers' load and to overcome the serious arrears which date from the war and early post-war years. Not only is the load growing steadily, it is growing at an increasing rate. An average increase of 7 per cent over the previous year's maximum demand means that the increment of load for which the development of the system must provide is itself increasing year by year.

This is indicated in the table, where the first two columns summarise the vital statistics of the system in 1948 and 1958, while the succeeding columns show the additions made during the past two years and the expected trend in the next two years. It may be of interest to consider the items in a little more detail.

The provision of new points of supply from the Generating Board is indicative of increasing dependence on the grid system for transmission from modern power stations to supply the distribution systems at many points. The areas supplied directly from power stations are being

GROWTH OF THE YORKSHIRE BOARD'S DISTRIBUTION SYSTEM

			At 31st March, 1948		At 31st March, 1958		Net Additions		Expected Additions		Expected at 31st March, 1962	
							1958–59	1959–60	1960–61	1961–62		
Points of Supply from C.E.G.B.	Total	New	18		28		3	—	2	1		34
		Reinforced					(1)	(2)	(3)	(2)		
Mains 66 kV, 33 kV, 22 kV Circuit miles	Total	Overhead	819	539	1,209	807	43	73	60	60	1 043	1,532
		Underground		280		402	18	20	23	26	489	
Substations 66/11 kV, 33/11 kV, 33/6·6 kV, 22/11 kV, 22/6·6 kV	Total	New	98		164		10	14	16	17		221
		Reinforced					(12)	(15)	(13)	(12)		
Transformer Capacity		MVA		1,027		3,015	302	440	450	470	4,677	
Mains 11 kV, 6·6 kV Circuit miles	Total	Overhead	4,260	1,473	7,554	3,968	320	252	220	200	4,960	9,060
		Underground		2,787		3,586	109	135	130	140	4,100	
Substations 11/0·415 kV 6·6/0·415 kV	Total	Pole Mounted	6,387	1,799	14,904	8,596	1,037	950	700	600	11,883	19,484
		Other		4,588		6,308	323	320	320	330	7,601	
Transformer Capacity		MVA		2,370		3,662	201	187	190	200	4,440	
Mains 415 V, 240 V Circuit miles			10,705		13,622		256	285	300	310		14,773
System Total Simultaneous Maximum Demand		MW	987		2,032		2,168	2,290	2,460	2,630		
Distribution Capital Exp.		£m	43·9		96·6		7·8	9·2	8·8	9·1	131·5	
Distribution Capital Exp. Simultaneous Demand		£/kW	44·5	50·4 Average	47·5		58·4 Average				50·0	

reduced in order to limit the loads, so that most of the increased demand is being met through new non-generating supply points connected to the 132 kV and, in some cases, to the 275 kV grid systems.

The first stage of distribution from most of our supply points is at either 66 kV or 33 kV and associated with the general increase is a tendency towards a higher proportion of underground cabling, as built-up areas extend and routes for overhead lines become more difficult to obtain. The numbers of new primary substations transforming from 66 kV and 33 kV to 6·6 kV and 11 kV are also increasing steadily, as also is their total installed transformer capacity.

The mileage of new 11 kV overhead lines is diminishing as the rural development programme is approaching completion. The proportion of farms in the Area which have a supply of electricity has now reached 93 per cent, while the proportion of other inhabited premises in rural areas which are connected is even higher. The end of the rural development programme is also bringing with it a reduction in the number of new pole-mounted transformers connected each year, particularly in the smaller ratings. The 11 kV distribution systems (and to a lesser extent the 6·6 kV systems) are being extended to meet the requirements of new houses and flats, public buildings, shops, offices and factories. Extensions for these purposes are largely by underground cable supplying indoor type substations or ground-mounted outdoor transformer equipments.

A substantial proportion of new substations and the associated high-voltage and medium-voltage mains are provided not for new consumers but to meet the increased requirements of existing consumers. This work has in the past been greatly hampered by restrictions on capital expenditure, but a determined effort has been made during the past year to reduce outstanding arrears, reduce overloading and improve the voltage conditions for many consumers. Some progress has also been made with the changing of consumers from non-standard to standard voltage supply, and the number of direct current supplies has been reduced to less than 1 per cent of the total. Many consumers are, however, still supplied at 200 V a.c. and the changing of them all to 240 V must of necessity be spread over many years.

The effect of external control over capital expenditure is shown in the penultimate line of the table, whilst the final line shows that the rate per kW at which capital is being expended has shown only a very modest increase during a period of more rapidly increasing costs.

NORTH EASTERN ELECTRICITY BOARD

By T. M. AYRES

M.I.E.E.

(Chairman)

The continued growth of demand for electricity by domestic, commercial and industrial consumers in the North Eastern Board's area has already necessitated large extensions to and reinforcement of the Board's high-voltage systems and low-voltage networks. There is every indication that these demands will continue to increase and plans have accordingly been made, in conjunction with the C.E.G.B., to establish within the next two years or so additional bulk supply points at selected locations in County Durham and in Yorkshire.

It has similarly been necessary for the Board to prepare plans for the reinforcement and extension of its 66 kV system, which extends throughout most of the Area, and these plans include the establishment in the next five years of some 16 new 66 kV substations, seven of which will be required to meet demands in Newcastle and other

Tyneside localities. This development work will give additional security and will improve the supplies afforded by the Board's 20 kV and 11 kV systems, which are also being further extended and reinforced. The latter work will involve the commissioning within the next two years of about 500 ground-mounted substations, together with the provision of 900 miles of additional high-voltage mains.

The increasing use by existing consumers of more electrical appliances has resulted in an appreciable rise in domestic consumption and, in spite of the highest priority having been given to reinforcement work, there is still quite a large number of low-voltage networks in urgent need of further reinforcement and steps have therefore been taken to accelerate this work within the limits of the Board's capital allocation.

A large proportion of the Board's area is of a rural character and rapid progress has been made in providing supplies to villages, hamlets and farms. Already 81 per cent of the farms are on supply, and during the next two years it is proposed to connect a further 1,300 farms. Thus, by the autumn of 1960, 85 per cent of the farms in the Area will be connected to the mains and it is the policy of the Board to continue as far as practicable towards further rural electrification.

A programme initiated by the Board some years ago for standardisation of low-voltage supplies is now nearing completion and, apart from supplies to certain premises which are scheduled for demolition, and a small number of specialised supplies, all other d.c. supplies will be changed over to the standard a.c. system by the end of 1962. Similarly, it is expected that all non-standard a.c. low-voltage supplies will be brought within the national standard by the end of 1960.

It is not possible to forecast the number of new industrial projects which may need to be met but, as with other classes of consumers, there is a steady growth of consumption for industrial purposes. In many cases the increased demands will require reinforced supplies, including new high-voltage substations.

So far as can be seen, new housing and rehousing should be maintained at a rate of from 18,000 to 20,000 new dwellings each year for the next two to three years.

There still continues a steady rate of conversion to electricity of the residue of gas street lighting and this, together with new lighting, will involve each year up to 10,000 services, which, although usually short, represent a substantial amount of work.

The cost of carrying out all these development works, together with the provision of improved engineering and commercial depots and other necessary expenditure, is expected to involve capital requirements of the order of £6-7 million annually over the next three years.

NORTH WESTERN ELECTRICITY BOARD

By T. E. DANIEL, M.Eng., M.I.E.E., M.I.Mech.E.

(Chairman)

The steady expansion of this Board's business is expected to be maintained throughout the foreseeable future, and to meet the demands a vigorous programme of mains extension has been planned. This will be spread over the whole of the Board's Area.

During the next two years the Board will extend its 33 kV networks widely and will construct twenty-eight new 33/11 kV and 33/6·6 kV transformer stations. These new substations will strengthen supplies in the large urban and industrial concentrations of Manchester, Salford, Stockport, Bolton, Wigan, Blackburn and Preston and in the coastal areas of Lancashire and Cumberland. To meet the growing load the Central Electricity Generating Board will provide ten new points of supply from the 132 kV grid system.

Apart from furnishing networks to supply new industrial, commercial and domestic demands, considerable work will be carried out by the Board in reinforcing supplies to existing consumers. About 760 miles of high-voltage and nearly 500 miles of medium-voltage mains will be constructed during the next two years and some 2,100 new network substations are to be constructed, of which about 1,200 will be of the pole-mounted type.

The Board has a special problem so far as rural electrification is concerned. Though the Area is mainly known for its concentrated industrial belt, there are wide stretches of countryside within its boundaries and electricity has already been made available to a great deal of this area. All but very few of the rural premises still to be connected lie in the Lake District which, because of its terrain and because it holds national parkland, presents particular difficulties. Elsewhere, only isolated farms remain unconnected, or small communities which, for some reason, have refused supply in the past.

In the Lake District some 5,600 farms are on supply, leaving about 2,600 farms without electricity. To speed the work of connection, the Board decided two years ago, with the support of the Consultative Council, to divide its Lakeland Sub-Area into 50 zones, so that work could be concentrated. This plan, which is now showing its full effect, allows all possible consumers to be connected in one zone before the next is begun. It is anticipated that this method will mean the completion of the electrification of the Lakeland Sub-Area at a faster rate and lower cost than intermittent development would allow.

During the next two years it is planned that 16 of these zones will be completed. Four schemes will bring supplies to areas in the Furness district; three to moorland country east and south-east of Kendal; two to areas of South Cumberland, north and south of Ravenglass; three to premises still without supply in the Cockermouth, Keswick and Buttermere area; two to farms in the Penrith vicinity; one to localities around Wigton, west of Carlisle; and another in an area centred on Brampton, east of Carlisle.

The Board has set as its target the connection of 600 farms and as many other rural premises in Lakeland in each of the next two years, at a cost of £700,000. If this pace can be maintained without outside interruptions, there is every hope that most farms in the Board's Area, and with them the other rural premises, will be offered a supply within six years.

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

By the Rt. Hon. LORD STRATHCLYDE

(Chairman)

A GRADUALLY increasing expenditure on network reinforcement with a reduction in new overhead line development is likely to be the pattern to be followed in the next few years by the North of Scotland Hydro-Electric Board. The 21,750 square miles in which the Hydro-Electric Board has the responsibility for the generation and distribution of electricity is one-quarter of the land area of Great Britain, but it has only 1,200,000 inhabitants or 2½ per cent of the total population. The ultimate consumer density is not likely to exceed 19 per square mile as compared with present-day figures of about 195 in the rest of Scotland and 255 for England and Wales.

Loads are growing everywhere in the Board's area, the number of kWh sold to the Board's consumers last year was more than three times what it was in 1948, and the use of more electrical apparatus and television makes consumers sensitive to low-voltage conditions. Even with the exercise of the greatest economy in planning by the Board, an increasing expenditure is required each year for network reinforcement. While reinforcement at all voltages continues, a considerable part of the expenditure is on new 33 kV feeders and supply points.

The Board naturally plans for continuing load growth and is building 132 kV lines for operation at 33 kV initially where it is clear that greater loads will justify the higher voltages within a few years. The same policy is adopted in the planning of main transmission lines and the Board has placed contracts for 270 circuit-miles of overhead lines between Beauly (Inverness-shire) and Kintore (Aberdeenshire) and between Kintore and Tealing (Angus). These lines will be operated initially at 132 kV and be raised to 275 kV working by about 1964.

To an increasing extent 132 kV lines are being used as feeders. An illustration is the twin 132 kV feeders capable of supplying a firm load of 120 MVA which have been run part of the way into the built-up area of Dundee.

The Board's 132 kV grid system, because of the thinly-populated character of the area, consists of long lines with a comparatively large number of substations reducing the voltage from 132 kV for bulk supplies. The load is now nearly 470 MW and the number of bulk supply points on the 132 kV system has reached 31 with six new points under construction and five in which the capacity is being increased.

Reinforcement work and supplies to new housing developments require many new substations and in built-up areas it is becoming difficult to secure the number of sites required. For example, each year about 15 new distribution substations are required in Aberdeen and about 25 in Dundee. Other arrangements such as buried transformers and basement substations are used where circumstances are suitable.

The Board has pressed ahead with rural development at a total capital expenditure of over £40 million and the proportion of consumers connected is now 90 per cent, which is a remarkable achievement in such a thinly-populated area. Much of this rural development has been uneconomic and the stage has been reached at which the high costs of connection result in fewer new consumers benefiting from the money spent on distribution.

The financial losses on the uneconomic sections of the distribution development are heaviest in the islands because the cost of local diesel generation is approximately double the cost of generation by water power on the mainland. Not only is fuel oil cost per kWh high but the percentage of spare plant is higher than is required on the mainland grid system.

To connect the majority of the premises which have not yet got an electricity supply would require an expenditure on each consumer of £400 and upwards. Indeed some of the costs are very much higher. It is difficult to see how high-cost consumers can be connected without the support of further remunerative hydro-electric schemes to maintain or increase the amount of electricity available for export to the south. It is only in this way that the Board can earn the additional revenue necessary to meet the annual losses which result from supplying rural consumers. Meanwhile the amount the Board and the consumers can contribute towards connection costs in the remote rural areas would not make supplies there even marginally economic. But given time and the help which can come from the development of new sources of hydro-electric power, it is to be hoped that these consumers can be dealt with.

At the same time the constantly-increasing demand within the Board's Area, reflecting as it does rising standards of living in the home, the expansion of tourism and modernisation, and increased production in agriculture and industry, also necessitates continued development of new sources of hydro-electric power.

These are some of the problems which are being tackled at the present time by the North of Scotland Board.

SOUTH OF SCOTLAND ELECTRICITY BOARD

By SIR JOHN PICKLES

B.Sc., M.I.E.E.

(Chairman)

A LONG-TERM review by the South of Scotland Electricity Board of annual capital expenditure on distribution shows that as compared with a current rate of £8·8 million, the figure for 1960 will be slightly increased to £9 million followed by a reduction to £8·5 million per annum in following years on the assumptions that the present rate of load growth is maintained and that prices remain stable.

The Board is fortunate in having completed not only its rural development programme but also the change-over from d.c. to a.c. and the standardisation of the voltage of supplies afforded to consumers. In consequence, more

[*Continued at foot of page 1012*

CO-OPERATION IN THE

THE ROLE OF THE TRADE ASSOCIATION

By STANLEY F. STEWARD, C.B.E.*

THE Power Convention provides a unique opportunity to look at the electrical industry as a whole. It is the only occasion of its kind, open on equal terms to manufacturer, supply authority and distributor; to private industry and public enterprise; to the technical, commercial and administrative sides of the electrical industry. It is this which gives it its value and, in my judgment, justifies the time and cost involved. Electrical people have an instinct for co-operation and the close personal links, joint approach to technical problems, and awareness of common objectives which run right through the whole industry have proved a great source of strength during the last decade.

It is a striking tribute to this spirit that, although one part of the industry has been nationalised, the constructive partnership between the supply industry and the electrical manufacturers is on a firmer basis today than ever before. This can be attributed in no small measure to the decision to establish and continue the B.E.P.C. in its present form.

With this in mind the Editor of the *Electrical Review* has asked me to contribute some thoughts on future co-operation within the electrical industry, with particular reference to the part to be played by the trade associations.

Trade associations, like all other organisations, must move with the times if they are to fulfil their purpose. We in the B.E.A.M.A. have given much thought in recent months to the ways in which our organisation needs to be adapted to carry out our policy in the years ahead. The B.E.A.M.A. celebrates its golden jubilee next year. When it was founded the electrical industry was in its infancy. The supply industry had been bedevilled by restrictive legislation which, although designed to safeguard the public interest, had the effect of restraining enterprise, hampering development and discouraging investment. By providing the means for co-operation between the manufacturers, the B.E.A.M.A. helped to produce stability, restore confidence and lay the foundations for the standardisation, technical training, research and development which enabled Britain's electrical industry to lead the world.

Over these fifty years we have seen a tremendous expansion of the electrical industry with far-reaching technical developments and fundamental changes in trading conditions. In two world wars the B.E.A.M.A. provided an important link between Government and the industry and also assisted with a number of semi-public functions such as allocations and licensing. In the years of depression between the wars its influence was decisive in maintaining co-operation and securing some measure of stability in the electrical manufacturing industry. At the end of the last war the Association set up, at the request of the Government, the electrical export groups which did much to re-establish electrical exports and laid the foundations of the industry's outstanding contribution to British exports in recent years.

The electrical industry now faces new problems with many difficulties and immense opportunities. Electricity has become the key factor in our standard of living. Its expansion is inevitable and it rightly claims a substantial share of the national capital investment. In just over ten years the supply industry has more than doubled the output of electricity, it has added some $4\frac{1}{2}$ million new consumers and enormously improved the efficiency of

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* Director, British Electrical and Allied Manufacturers' Association.

ELECTRICITY BOARDS' PLANS (continued)

attention is now being given to intensive load-building and to reinforcing the distribution system to keep pace with increasing demand.

Of particular interest is the ever-wider adoption of electric floor warming for new buildings of all types which the Board has done so much to pioneer. The total connected load supplied under the various off-peak tariffs available to consumers now exceeds 230 MW and is increasing at the rate of 50 MW per annum.

Some 22,000 houses will be connected this year, and with the large-scale all-electric re-development schemes being undertaken, particularly in Glasgow and Edinburgh, and the provision being made for many new schools and hospitals, it is confidently predicted that, with a continuation of the recent improvement in the level of industrial activity in Scotland, the present rate of increase in load of approximately $6\frac{1}{2}$ per cent will be well maintained as far ahead as can reasonably be foreseen.

The amount of new plant and equipment required each year to extend and reinforce the distribution system to cater for the further demands to be made on it is approximately as follows:—Transformers: 800,000 kVA, comprising 1,500 units; e.h.v. circuit-breakers: 1,000, together with the modification or replacement of 1,500 o.c.b.'s to be completed in 1963; cable: 560 miles, including services; and overhead lines: 500 miles, mostly wood pole.

The disposal by the Board of the principal types of appliances during the next few years is expected to be as follows, on the assumptions that no further hire-purchase restrictions are introduced and no changes in purchase tax are made:—Cookers, 35,000; water heaters, 18,000; washing machines, 15,000; wash boilers, 7,000; and refrigerators, 7,000.

ELECTRICAL INDUSTRY

Although the Restrictive Trade Practices Act has defined and limited the ways in which manufacturers may co-operate, the work of the trade associations is perhaps more important than ever. The author deals largely with the work and intentions of the B.E.A.M.A. but this, the leading electrical trade association, sets a pattern which may profitably be followed by others in the industry

generation and distribution. The manufacturers' output has increased in a similar way and last year reached a value of £1,400 million, of which nearly £300 million was exported. These two sides of the industry therefore share a major public responsibility and their continued close co-operation is a matter of vital national importance.

For some important products the supply industry is, for all practical purposes, a powerful, though enlightened, monopoly buyer in the home market. The increase in the size of generating plant and of station capacity has reduced the number of individual contracts, and the rapid developments both in nuclear and conventional fields have imposed on the manufacturers a tremendous burden of research and development costs. In addition, we now have the impact of intense world competition and the uncertainty created by the restrictive trade practices legislation. We are therefore entering a period which may well be decisive for the future of the electrical industry as a whole.

Function of a Modern Trade Association

It is against this background that the B.E.A.M.A., in common with other major trade associations, faces the future.

The primary purpose of any trade association must always be to promote and protect the interests of its members, and in an industry so vital to the national economy as electricity these interests must coincide with the national interest. A trade association has therefore to play the role of an industrial public service—helping the industry it serves to be progressive and prosperous so that it plays, and is seen to play, its rightful part in the national economy. This is no easy task and it calls for staff of high quality, imbued with a sense of service and working within the framework of a clearly defined policy.

Our policy in the B.E.A.M.A. can be stated quite simply. It is to foster understanding and co-operation between members, to aid the expansion and development of the whole industry at home and overseas, and to ensure that there is general recognition of the importance to the national economy of a progressive, efficient and prosperous electrical manufacturing industry. It may be of interest to mention some of the ways in which we plan to give effect to this policy.

Statistics and Information

It is through the provision of up-to-date and comprehensive statistics and information that a trade association can help to ensure the stability as well as the progress of an industry. The whole field of the collection and dissemination of statistics and market information, the study of trends and overseas competition and the interchange on such matters as cost comparisons, prices and discount structures may well form a primary responsibility of trade associations in the future. This is a service which can be secured only through an association enjoying a wide measure of support and trust; with this backing an association can do much to stimulate enterprise and efficiency and encourage sensible trading policies.

A good example arose when the Board of Trade decided to discontinue the collection of statistics on domestic electrical appliances. With the full support of the Board, the Association assumed responsibility for the collection, on a confidential basis, and the publication of statistics for the whole industry. As a result, summaries and trends of production and exports for each main category of domestic appliances are now issued regularly; these are of great value to the firms themselves as well as to the public authorities.

Electrical Exports

In the export field it is the primary duty of a trade association to ensure that the export efforts of its members are supported by up-to-date commercial intelligence.

Electrical manufacture is one of Britain's leading exports and represents over 10 per cent of our total exports of manufactured goods. Individual enterprise, backed by performance and service, will always be the mainspring of our export effort, but there are many things which can best be done jointly through the trade association. There are at present ten B.E.A.M.A. overseas committees which provide a forum where British manufacturers and their representatives in overseas countries can discuss common problems and have the support of their parent association in representations on duties, quotas and other matters affecting electrical trade in the territory. Co-operative action on technical and commercial aspects of overseas trade has become more necessary than ever in the face of combined action by groups of foreign competitors sponsored in many cases by their governments.

The initiative taken by the United Kingdom in bringing together in London this month representatives of European domestic electrical appliance manufacturers has already borne fruit. A single association is now open to the trade associations concerned in all the Western European countries and will help to secure understanding and agreement on technical and commercial matters which will facilitate trade between the " Six " and the " Seven." This country was able to take the lead in this matter because the B.E.A.M.A. was in a position to speak on behalf of a united and influential Domestic Appliances Division.

Standards and Safety

The vital importance to the electrical manufacturing industry of up-to-date standards hardly needs to be stressed, and this again is a field in which manufacturers must have a clear-cut policy and bring their influence to bear while schemes are in the formative stage. The B.E.A.M.A. already has nearly 2,000 representatives on over 600 B.S.I. Technical Committees, Sub-Committees and Panels and has strengthened its Standards Department to provide early interchange of information and co-ordination of standards activities.

The value of this work to the public as well as to the industry was recognised by the Molony Committee on Consumer Protection. The Committee also commended the new Electrical Approvals Board for Domestic Appliances the existence of which is the direct result of co-operation between the B.S.I., the supply industry and the B.E.A.M.A. In this context, I believe that trade associations can do much to ensure that any future legislation on safety requirements shall proceed by reference to appropriate British Standards, so that manufacturers can play their full part in preparing the technical basis of any such regulations. Looking to the future again, international standards will become increasingly important as the "newer" countries seek the guidance of international recommendations when establishing their own technical standards and practice. By providing the facilities for this work, by taking the initiative and exerting continuous influence, trade associations can provide a service of inestimable value to their industries.

Government and the Public Corporations

A most important pointer to the future will be found in the changing pattern of economic and social life in the last fifteen years. Governments at home and overseas have assumed and continue to take upon themselves increasing responsibilities in such fields as the maintenance of employment, regulation of investment, location of industry and conduct of international trade. State buying and the growth of public corporations in many countries are also important factors affecting relations between governments, between industry and government, and between private and public sectors of industry. This new relationship between government and industry is so important that it is worthy of closer examination. The convenience to the government of having a consultative body for a whole industry is immediately apparent. From the point of view of a particular industry, it is equally important to have a well-organised, comprehensive organisation which will not only speak with authority for the industry when consulted by the government of the day, but will also take timely action to represent the industry's views at official level while policy is being formulated.

Associations which are fully representative of their industries are an invaluable source of expert knowledge and advice to government departments, and the regular interchange of information and consultation has become an established and growing feature of public administration today.

The range of topics discussed between industrial associations and government departments is wide and includes export promotion, tariff negotiations, purchase tax, location of industry, recruitment, technical and research problems, the exchange of statistics and economic information. To secure co-operation in the best interests of its industry, an association has to approach problems objectively and must be seen by the government to take a broad view. It must also have the technical, legal and other resources to deal with the multiplicity of problems affecting both industry and the state. The confidence established between government officials and association staffs is all-important in ensuring that results are achieved in the interests of industry and the public. I am convinced that one of the things we must do is develop further this positive approach to relations between government and industry.

In the same way consultation between the electrical manufacturing industry and the public corporations, which together take a substantial part of the industry's home output, is a matter of great importance. The B.E.A.M.A. already has close links with the National Coal Board, the British Transport Commission and, of course, a particularly close and frank partnership with the electricity supply industry.

In the operational field there are many joint committees dealing with technical and commercial problems of mutual interest and over the years these committees have established a common approach to such matters as specifications and performance which has proved of immense value to the whole industry.

The policies and programmes of the supply industry have an important bearing on the plans made by manufacturers, and the interchange of information and views between the two sectors of the industry has been mutually beneficial. The arrangements for consultation on policy matters have recently been modified to take account of the change in the structure of the supply industry. It is hoped shortly to introduce arrangements for consultation between the chief commercial officers of the Area Boards and our Domestic Appliances Board so that commercial and sales development problems of common interest can be kept under review.

All these arrangements reflect the goodwill and common purpose which are characteristic of our industry. There is ample evidence of enterprise in the public sector and a full recognition of public responsibility by private enterprise. The whole industry benefits by the progress of each part, and electrical development is a common cause in which every section of the industry must play its part and assume its full responsibility.

Institute of Physics and Physical Society

THE incorporation on 17th May of the "Institute of Physics and the Physical Society" marks the fulfilment of the desire expressed by the overwhelming majority of the members of both bodies that the scheme for amalgamation prepared by a Joint Committee should be implemented. The originating bodies will shortly be formally wound up and their assets handed over to the new one. The first president of the amalgamated body is Sir John Cockcroft.

The Physical Society of London, as it was then called, was founded in 1874 and on the initiative of that society's council the Institute of Physics was founded 45 years later. Broadly speaking, before the war the scientific meetings and publications of the Institute were confined to applied physics while those of the Society were concerned more with pure physics. As, however, the boundary between these two aspects became less definite there has been increasing overlap in the activities of the two bodies and in their membership, and during the past 20 years there have been repeated proposals for amalgamation.

Management in Electricity Supply

ACCORDING THE PROPER TREATMENT

By L. J. LUFFINGHAM, A.M.I.E.E.*

The author states that although on the surface the electricity supply industry appears to provide a satisfactory and satisfying career, in the upper strata of the organisation there is to some extent a feeling of uncertainty and resentment. He explains the causes and suggests remedies

Any generalisation about the electricity supply industry is bound to give a distorted picture in greater or lesser degree. Any suggestion, then, that today it is not as a whole a happy industry would rightly be strongly refuted and dismissed with contumely. It might well evoke the criticism that such a comment should not be made publicly, not in print anyway. But, on the other hand, it is not to be denied that there is frustration and unease in some quarters. There is evidence of this in the archives of the staff associations, though admittedly these records give perhaps an over-emphasised reflection of such discontent as exists because the associations provide the focal centre and channel for ventilation and redress of grievances and injustices, and of claims and appeals. But the significance of this " writing on the wall " should not be ignored or unduly discounted by those who have concern for the future well-being of the industry.

Superficially, and to a great extent in reality, the electricity supply industry has everything. It is an expanding, vital, industry with an assured career future for the present and the coming generation, to look no further. It is a prosperous industry that has made millions in profits every year since nationalisation; the accumulated surpluses aggregate well over the £100 million mark. It is an efficient industry, generating and selling electricity at only about one-half as much again as the pre-war cost to the consumer. It is an intriguing industry technically and administratively, with fascinating problems in all fields of engineering, civil, mechanical and electrical, and in organisation.

There is negotiating machinery safeguarding the salaries and conditions of service throughout the industry; there is joint consultation at all levels, from the boiler house floor to the Board room; there are comprehensive education and training facilities for all classes of employees; and there are scholarship schemes for those with the aptitude to take advantage of them; and finally there are generous provisions for superannuation, and much more besides. Above all there is, in general, among the top people a benevolent, even generous, spirit in human relations matching with the best in other industries.

Yet with all this it is occasion for surprise that the industry has failed fully to maintain, let alone increase adequately, its intake of younger personnel of the right quality who may be expected to measure up to the senior managerial responsibilities in the future. This has, of course, as any personnel malaise in the industry must do, given considerable concern to top management and a number of remedial measures have been initiated. But perhaps there has been more looking outwards rather than inwards. One of the most important functions of management is the promotion of good human relations, securing that employees are happy and contented and can give of their best in the sure knowledge that they will be properly rewarded and equitably treated in all matters affecting the conditions of their service. Clearly, the managerial grades cannot promote this relationship with the industry's personnel in general if they themselves are afflicted with frustration and unease.

Aspects of the " Fourth Leg "

To clarify thinking in this connection it will be helpful to consider in some detail certain aspects of the operation of the " Fourth Leg " of the negotiating machinery. This should perhaps be defined for the benefit of readers who do not know what it is. The " Fourth Leg " is the section of the negotiating machinery, set up as a statutory obligation under the 1947 Act, in which the salaries and conditions of service of all but a few of the top level and key appointments in the managerial grades are negotiated between the designated staff associations, e.g. the Association of Managerial Electrical Executive, and the Boards. It is the forum where all general and individual problems affecting senior personnel are discussed and resolved—with a right of appeal to independent arbitration in the event of failure to agree.

A basic agreement on salary scales was thrashed out in the years following nationalisation and nowadays negotiations are mainly concerned with reviewing the agreement from time to time, smoothing out the repercussions of changes introduced in the organisational structure of the industry, and settling the claims and appeals of individuals who may feel they are inequitably graded or unfairly treated.

Basically, there is nothing wrong with the " Fourth Leg," but it does not command the universal confidence it should do. There are still some who feel that managerial appointments should not be negotiated for on the same pattern as wage rates and salary scales for manual workers and other employees—and they stand aloof. A few in top level posts who have had experience of the machinery think—mistakenly—that they would do better for themselves if they were transferred to the small " non-negotiable " group. The majority, while appreciative of the advantages inherent in the " Fourth Leg," feel that bargaining in relation to managerial grades is out of spirit with the relationship that should exist at this level, and as individuals they are loth to invoke its aid. A few who have been moved to submit appeals for upgrading, or to make claims on other grounds, have become thoroughly disillusioned by the dilatory tediousness of the procedure, which may drag on for two, three, four or more years.

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* Secretary, Association of Managerial Electrical Executive.

Consultation: and Investigation

Consider next the functioning of joint consultation in the supply industry. In theory, and largely again in practice, the arrangements are comprehensive and admirable. There is a National Joint Advisory Council, District Councils and several hundred Local Advisory Committees. On occasions, however, experience has shown that reorganisation proposals can be announced and discussed at Local Advisory Committee level before they have been made known, officially anyway, to senior personnel whose positions and careers may be affected. Such incidents do nothing to uphold managerial status and are to be deplored on all counts. The question naturally arises, when and where does, or should, joint consultation begin? It should be before and not after policy decisions are taken, and should start at executive management level.

Yet another contribution to the spread of unease at managerial levels is the increasing practice of Boards to call in outside firms of business consultants and administrative experts to investigate and advise on sections of their organisation. No one would deny that in some cases this is useful and can be conducive to improved overall efficiency. But this objective will be achieved only when the investigation is done with the prior full knowledge and willing consent of the departmental and section heads whose activities are to be reviewed; and preferably when it is a combined operation. Without co-operation the consequences to managerial confidence can be shattering. Definitely outside advisers should not be used as a screen by Board management unsure of its own competence.

Compensation—on What Basis?

The picture that has been highlighted in the preceding paragraphs may prompt the question: If there are frustrated and disgruntled individuals occupying important posts in electricity supply, why don't they get out? But this is no simple matter. Consider a few cases. First, the man within two, three or a few years of retirement who has been made redundant under a reorganisation scheme but has been offered an appointment at lower status, but with preserved grading and salary on a personal basis. He won't be of much use to himself or his employer-Board during the rest of his service, and it is unlikely that salary increases in the final three years will affect his ultimate pension position significantly. But he has no firm basis on which to assess compensation should he ask to be retired early. So generally he will see his time out without enthusiasm, though it might pay the Board to deal with him generously.

Secondly, consider the individual similarly circumstanced but with some ten or more years' service to run. He may still hope for advancement and increased salary but his scope is restricted because of the fewer senior appointments to which he can aspire as a result of reorganisation. Few individuals so placed would wish to leave the industry, but the opportunity should be offered, with a clear indication of the compensation and pension basis on which this might be agreed. The more general solution, however, would be stronger action to ensure that such individuals are considered for suitable appointments elsewhere in the industry when these would otherwise be filled by applicants from outside.

The third, and, in respect of the future of the industry, the most important group are the below-managerial-level aspirants for advancement who have adopted electricity supply as their career. They have much to encourage them in the clear evidence from the past and present that the ladder of promotion reaches from the lowest to the topmost rung for those with the ability to scale it. The principle and practice of promoting senior managerial personnel to the Boards as occasion serves is a tremendous inspiration to all lower levels. But for many just starting or in mid-career the recent trend in local reorganisation towards a reduction of the number of medium-level managerial posts is more than a little disconcerting. A fairly common pattern is emerging of one senior post to five of medium-to-junior level, and the extent to which this must lead to frustration among the five in the normal process of promotion presents a problem. It already exists and will become more widespread with time. What is needed in this connection is a clear indication of what the general structure and organisation of the industry will be in its ultimate pattern so that none need drift unknowingly into a cul-de-sac appointment from which there is small chance of escape by promotion, while withdrawal is to all intents and purposes impracticable.

Towards a Better Future

These somewhat discursive and random notes provide a prologue to what it is hoped will be accepted as constructive suggestions for the improved operation of the negotiating machinery in so far as managerial grades are concerned.

First and most important is the need to recognise, and make adjustments for, the fact that the " Fourth Leg " is different in kind from the other three sections. The concept of two sides, one that must grasp all it can and the other that must concede as little as possible, must be tempered or replaced by a spirit of trust and co-operation. The Boards should recognise that their first consideration must be an efficient executive management, which means satisfied managerial staff. The staff associations on their part must recognise that pressing collective or individual claims beyond what is fair and reasonable, and in line with conditions in other industries, is not in the best interests of those they represent, or of the industry. Both parties must co-operate on a mutual, not one-sided, give-and-take basis, to fulfil the responsibilities of management of the industry.

Secondly, the existence and functioning of the "Fourth Leg" needs to be more widely popularised and publicised. The axiom that the light of good deeds should not be hidden applies. But the operation of the machinery must be speeded up to give decisions in months at longest—not years. There are many ways in which those responsible for policy management can identify themselves more closely with the negotiating machinery, not the least of which would be, for many, earlier and closer consultation with executive management before policy decisions are taken and implemented. Thereafter, team co-operation must prevail, and what has been decided on must be prosecuted by executive management with conviction and enthusiasm.

Thirdly, everyone in the industry has a right to know where he or she stands. There should be a clear indication and explanation of the anticipated future structure and organisation of the industry, not vague generalisations and piecemeal changes as time and opportunity serve. That would be adequate for the staffs in general; they would know where they fitted into the industry and their career prospects. Individuals, on the other hand, whose positions or prospects had been, or might be, adversely affected by reorganisational changes should be given some basis on which to assess possible compensation if they could not be found acceptable alternative employment. "Something not less favourable than the Staff Compensation Regulations under the 1957 Act" might provide a suitable yardstick.

Through policy and executive managerial co-operation, earlier and closer consultation, and generous redress of hardship occasioned by change could emerge more speedily the keenly efficient streamlined supply industry that the future prosperity of Britain needs.

To avoid any sort of misunderstanding, the writer would like to make it clear that while the comments and suggestions that are put forward are made with background knowledge of the industry during the full period of nationalisation, and latterly of the "Fourth Leg" machinery derived from close association with the A.M.E.E., they are the personal views of the writer and are not necessarily those of that Association.

ORGANIC MODERATED REACTOR

TWO films were shown in London recently giving details of the organic moderated reactor system on which the English Electric Co., Ltd., under a collaboration agreement with Atomics International of the U.S.A., will base small power station and ship propulsion tenders. The concept of a reactor cooled and moderated by an organic liquid was first suggested in 1944, but studies on the properties of various organics suitable for reactor use were not initiated until the early 1950's. The films largely dealt with an experimental installation to determine the feasibility of the concept constructed at the National Reactor Testing Station in Idaho. In parallel with this experiment Atomics International, a division of the North American Aviation, Inc., instituted a study of large-scale organic-cooled power plants of both 75 and 300 MW electrical output ratings. A prototype 11·5 MW plant is now under construction at Piqua, Ohio, as part of the U.S.A.E.C. programme. One application of this type of reactor is in marine propulsion, and English Electric and Atomics International are jointly preparing a tender for a tanker installation for the Ministry of Transport.

The organic liquid, circulated through the reactor, is both heat transfer vehicle and neutron moderator. In passing it is irradiated and forms various decomposition products, and a small amount of pyrolytic damage occurs. To control this, a small quantity of coolant is withdrawn and replaced by distilled coolant. The rate of damage is approximately 1·4 per cent per day, hence approximately every 70 days the organic coolant is replaced. The moderator-coolant is solid at room temperatures and therefore equipment and pipes containing it must be heated. Both steam and electric heating systems are satisfactory. Most of the reactors have been based upon organic compounds (a carbon-hydrogen liquid) being turbulently forced past the fuel, removing heat at a rate that limits the fuel-plate surface temperature to 750 to 860°F. This is accomplished without boiling, but if boiling is permitted higher power-density reactors can be designed. Boiling mixtures of terphenyls and mixtures of benzene and diphenyl are being developed. Aluminium oxide - aluminium matrix alloys have been adapted as a cladding material for the fuel elements. Construction of an experimental organic-cooled reactor (EOCR) was recently initiated at the Idaho station and is expected to be critical late in 1961. It will provide advanced data on coolants and fuel. The initial fuel loading will consist of approximately 55 kg of U235, and the reactor will operate at power levels up to 40 MW with fluid temperatures in the range of 500 to 700°F.

Public Ownership of Electricity Supply

Mr. Ernest Long (member, Central Electricity Generating Board) is this year's president of the Chartered Institute of Secretaries and at the annual conference of the Institute at Norwich he read a paper entitled "Electricity Supply: Twelve Years of Public Ownership." In this Mr. Long, after giving a brief history of the British electricity supply industry, described the structure set up upon nationalisation, and subsequent changes. He laid stress upon the magnitude of the industry and also of its problems—particularly those relating to finance. He noted that the Treasury always had to be convinced that the case for spending was sound and that, in general, the Boards did not always get approval for the sums they required. One difficulty was the necessity for extended forward planning, particularly in the provision of generating stations.

Mr. Long touched upon a number of other subjects familiar to our readers, e.g. the fuel situation and prospects (introducing the matter of nuclear power) and the extent and nature of the industry's research.

Incidentally, we may mention that another member of the industry is vice-president of the Institute—Mr. S. M. Rix, deputy chairman of the Southern Electricity Board, who contributes to the Area Boards' survey section of this issue.

The history of the trolley-bus service in Bournemouth and the considerations which led to its adoption are reviewed. Details are given of the trolley-buses themselves, and the supply and overhead systems are described. The article shows that these vehicles are the ideal means of transport for fixed urban routes

OUTSTANDING ADVANTAGES OF ELECTRIC TRACTION TO THE CORPORATION TRANSPORT SYSTEM

Trolley-Buses in Bournemouth

By W. D. REAKES, M.Inst.T.*

AT a time when some transport authorities are replacing trolley-buses with motor-buses, the Bournemouth Corporation not only continues to operate a fleet of 90 trolley-buses, but bought 30 new buses in 1959 and has ordered ten more for delivery next year. In 1953, a new repair and maintenance depot was built at a cost of £500,000. Although this depot also caters for motor-buses there are extensive facilities for trolley-buses. Three new traction substations were constructed and equipped in 1955.

Trolley-buses were first introduced in Bournemouth in 1934 to replace the old tramway system. Factors taken into consideration by the Council in reaching this decision included all the well-known advantages of this form of transport. The trackless electric vehicle is silent and smooth in operation with an entire absence of fumes; there is little vibration and no gear changing is required. These factors give a greater degree of passenger comfort than any other type of transport and, of course, trolley-buses have smooth and matchless acceleration. It is sometimes said that the latter advantage is balanced by the fact that trolley-buses are unable to overtake each other. However, the "leap-frogging" activity of motor-buses in large cities does not seem to be an advantage and even appears to cause buses to congregate in groups. Overtaking is, of course, required where different routes use the same bus stop and, in Bournemouth, extensive use is made of passing wires at such places. The criticism often heard that trolley-bus routes are not flexible is not a considered argument. Motor coaches and taxis need complete mobility, but fixed route transport is ideally served by trolley-buses. Another criticism is that if the power fails, all trolley-buses are held up. If this argument were sound, there would be little case for railway electrification and the vast industrial electrification that

Open top Bournemouth trolley-bus

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* General Manager, Bournemouth Corporation Transport Department.

has taken place and is proceeding at an ever-increasing pace. There is more danger in making all transport dependent upon vulnerable overseas oil supplies.

Among other factors taken into consideration by the Council in 1933 was the fact that, leading from the centre of the town, very steep inclines are encountered. In particular Richmond Hill rises in places to 1 in 8, and carries a very high frequency of transport services. Whilst there is no doubt that the motor-bus would have negotiated this route, the smoothly operating trolley-bus shows up to maximum advantage.

Although the Council was anxious to institute a transport system which would be in character with the general atmosphere of a seaside and health resort, the decision was not reached merely on the score of maximum comfort and amenities. The system had to be practical and economical. Before a final decision was made several members of the Council visited Wolverhampton and inspected the trolley-bus system there. Over the past 26 years, it has been found that the trolley-bus operating cost per seat mile is lower than for motor-buses. The life of a trolley-bus is also longer by about 20 per cent and its maintenance is far more economical.

After experiments with vehicles equipped with various manufacturers' traction motors and control gear, orders were placed for 103 trolley-buses. The choice was for Sunbeam chassis, carrying British Thomson-Houston 201 traction motors and B.T.H. control gear. The bodies were of composite construction produced by Park Royal to the Bournemouth specification which included the standard layout of two staircases—a feature included in all the Bournemouth vehicles and found to be extremely useful in handling the holiday traffic. The vehicles were of the three-axle type, 28ft 6in long with a seating capacity of 56. The traction system allowed for regenerative control and in addition the vehicles were fitted with hydraulic brakes.

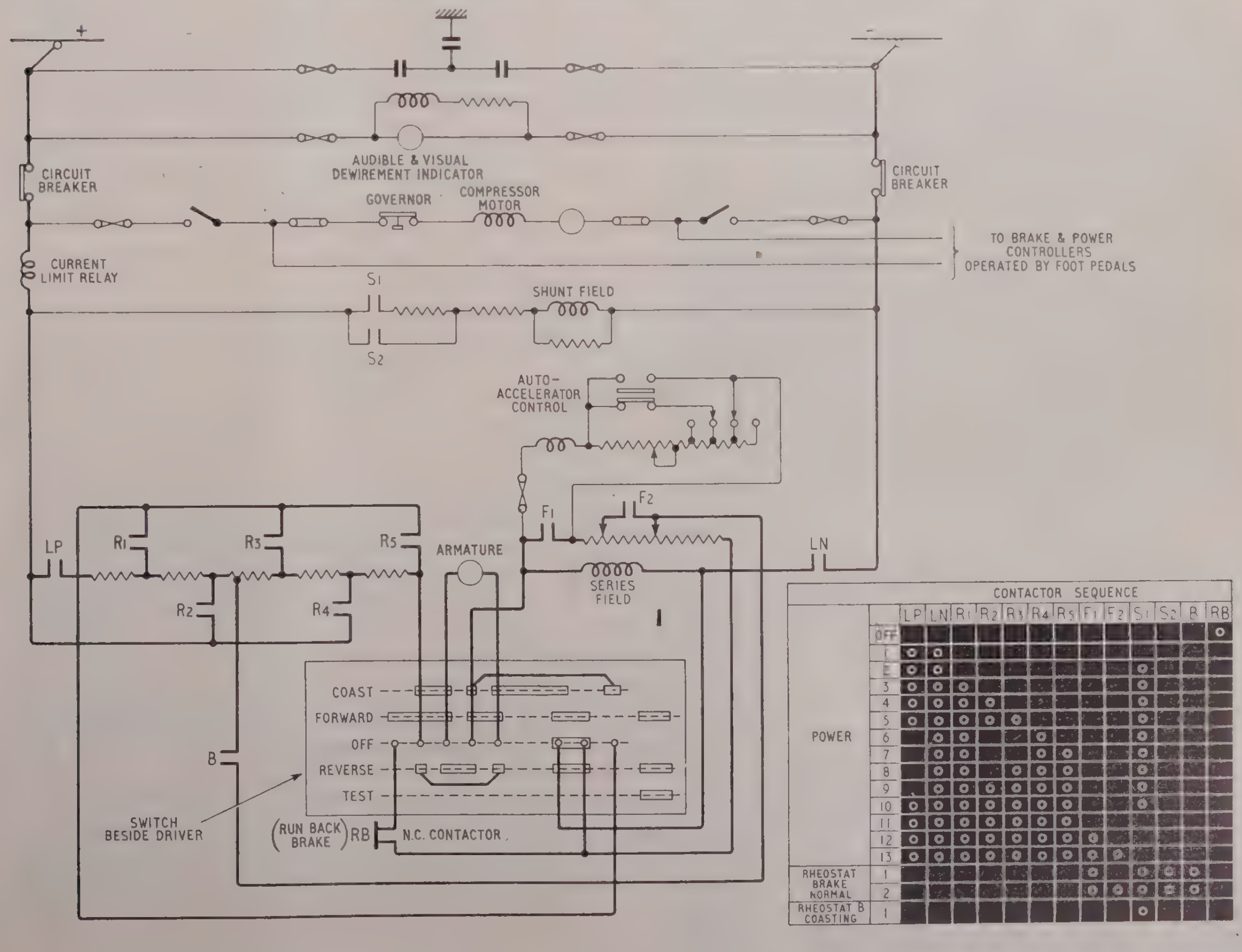
Whilst the majority of the vehicles purchased in 1933 and 1934 have been replaced, a number are still in service with the original equipment, having completed well over three-quarters of a million miles, and they have given very little trouble.

The present trolley-bus fleet consists of 29 of the original three-axle Sunbeams, 24 three-axle British United Transport vehicles (purchased in 1950), 30 two-axle Sunbeams (purchased in 1959) and seven ex-Brighton Corporation two-axle Sunbeams. All the latest buses have Crompton Parkinson and Allen West electrical equipment. The licensed fleet in winter is 63.

None of the trolley-buses is equipped for battery operation as it was considered uneconomical to provide a large, heavy and expensive battery for manœuvring. Large turning circles have been provided where necessary.

A schematic diagram of the latest trolley-bus control system is shown in Fig. 1. With the main switch in the "forward" position the drum controller is operated by a foot pedal and the motor accelerates under automatic control. This gives rapid and smooth acceleration with

Fig. 1.—Schematic diagram of the latest Bournemouth trolley-bus control system



CONTACTOR SEQUENCE

		LP	LN	R1	R2	R3	R4	R5	F1	F2	S1	S2	B	RB
POWER	OFF													○
	1	○	○											
	2	○	○								○			
	3	○	○	○							○			
	4	○	○	○	○						○			
	5	○	○	○	○	○					○			
	6		○	○			○				○			
	7		○	○			○	○			○			
	8		○	○		○	○	○			○			
	9		○	○	○	○	○	○			○			
	10	○	○	○	○	○	○	○			○			
	11	○	○	○	○	○	○	○						
	12	○	○	○	○	○	○	○	○					
	13	○	○	○	○	○	○	○	○	○				
RHEOSTAT BRAKE NORMAL	1								○		○	○	○	
	2								○	○	○	○	○	
RHEOSTAT B COASTING	1										○			

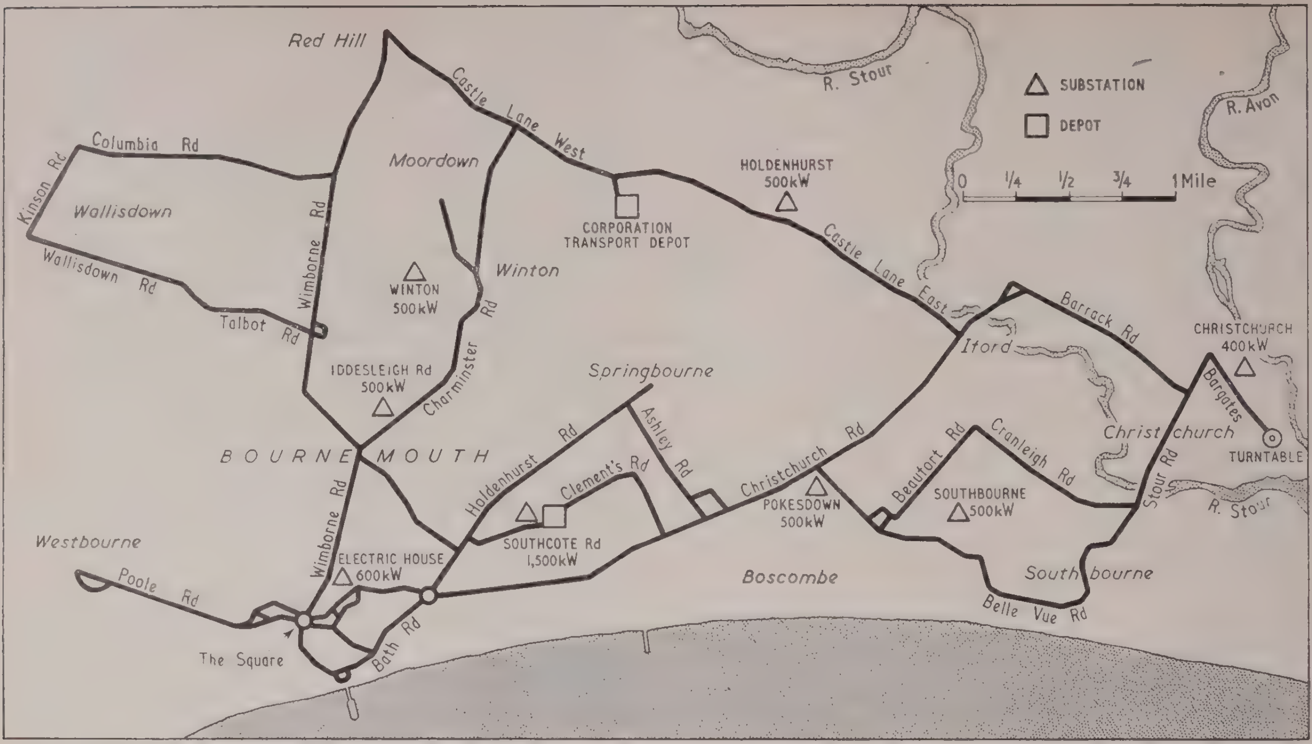


Fig. 2.—Map of the Bournemouth district showing trolley-bus routes and substations. The position of the Christchurch turntable is also shown

maximum comfort as the motor cannot be accelerated faster than this system allows. Another foot pedal operates the rheostatic braking system which is used down to about 3 m.p.h. when further pressure on the pedal applies air brakes. (Regenerative braking is not as efficient as rheostatic braking and so air brakes are required at about 10 m.p.h.) If all power and the air pressure is lost, a run-back brake is provided. This "shorts" the motor and will slow the bus to about 1 m.p.h. down steep inclines. This gives a safety that is unmatched by any other form of road transport.

Supply System

Before 1955, the Transport Department generated 60 per cent of the electrical power needed for traction purposes, the remainder being taken from the Southern Electricity Board. Since September, 1955, the whole of the demand has been met by the Southern Board. This change-over involved the construction and equipping of three additional substations in the borough, which then made a total of eight with a total output of 5 MW made up as shown in Fig. 2. The S.E.B. supply, in each case, is taken at 11 kV, three phase, with a nominal d.c. output at 565 V, rectification being 12 phase.

The Department's maximum demand varies considerably between summer and winter. Present winter maximum demand figures fluctuate around 2,000 kW, whilst at the height of the season a figure of 2,700 kW may be recorded. Traction consumption for an average week in

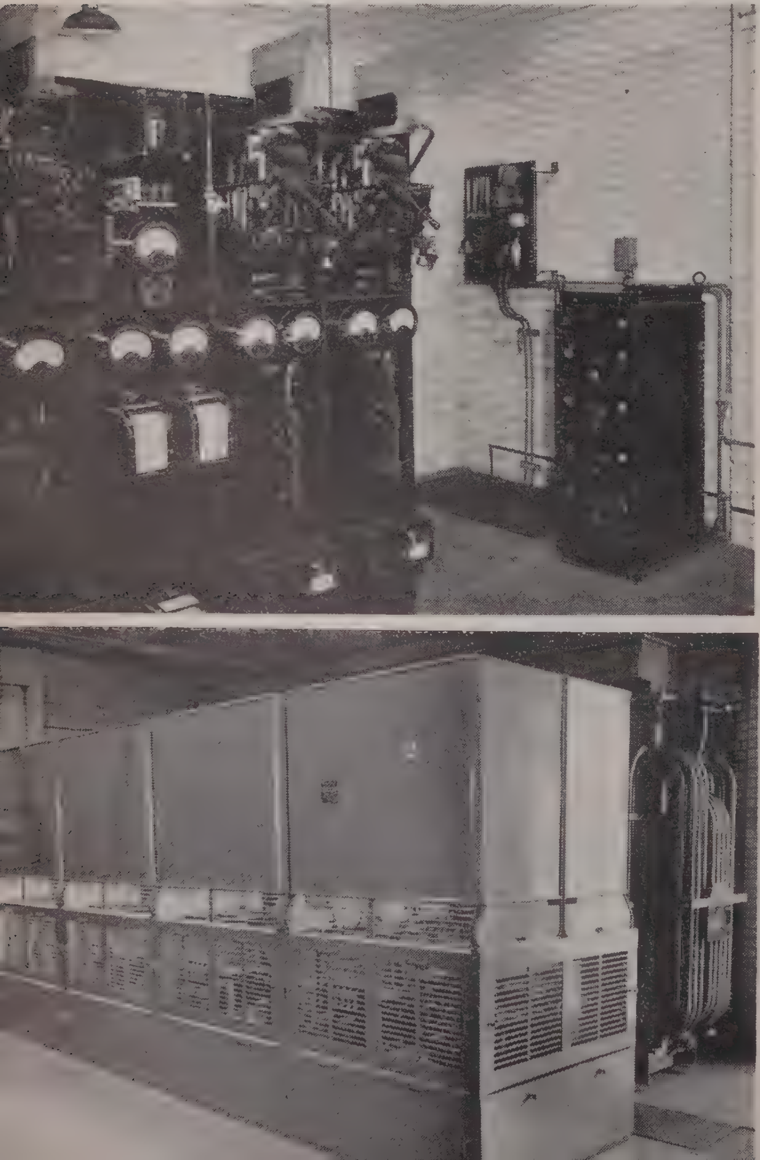


Fig. 3.—Top left: Part of the d.c. switchboard at Southcote Road substation, also showing the regenerative relay panel (centre) and the ballast resistances (right). Bottom left: Hackbridge & Hewittic mercury-arc rectifiers and transformers at Southcote Road substation

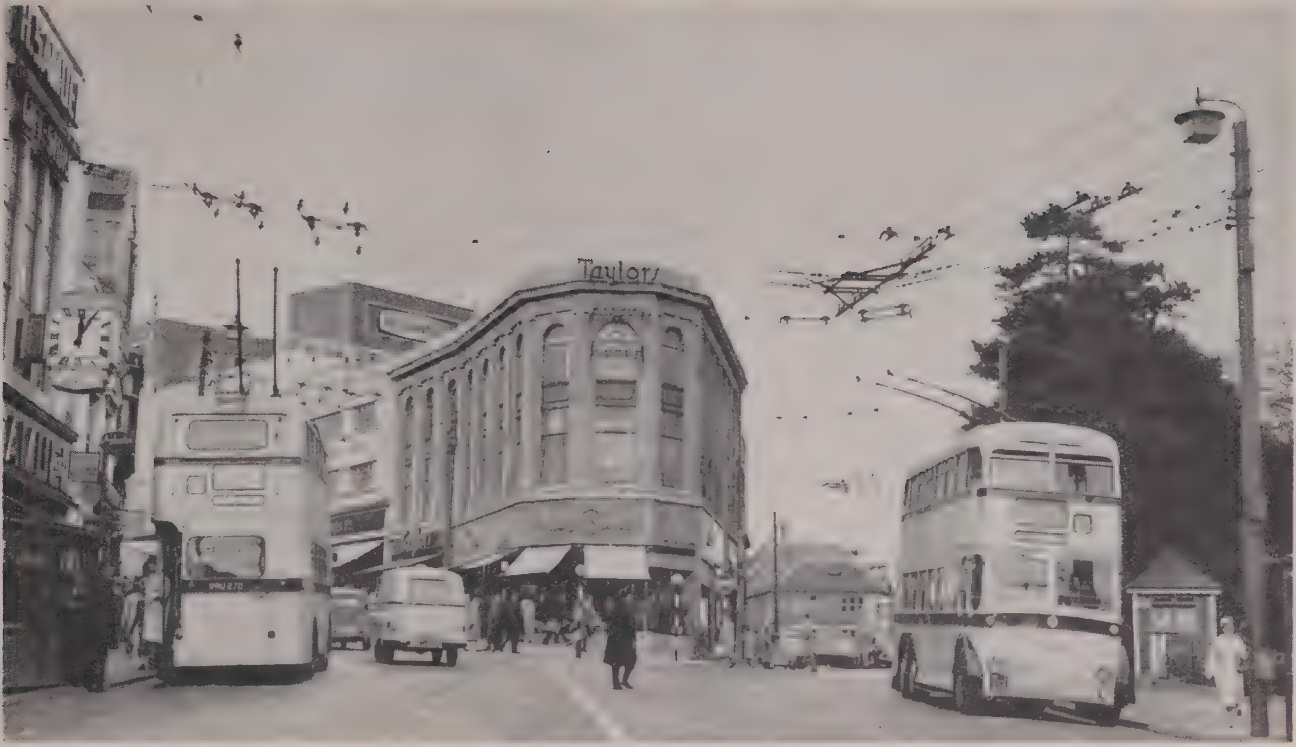


Fig. 4.—A good example of passing loops for trolley-buses in Bournemouth

winter is around 130,000 kWh, while in summer it may well be 200,000 kWh, giving an annual consumption of something approaching 7,200,000 kWh.

Maintenance in the three new substations is undertaken by the Department's own staff. In the case of the five substations which existed before the change-over, maintenance is carried out by the Electricity Board's staff because other h.v. switchgear is housed in the same building. The arrangements worked exceptionally well and until recently the more important stations were permanently manned by the Board's staff for their own purposes. This was particularly helpful at Electric House and Christchurch substations where the d.c. circuit-breakers were of early design and of the manual reset type.

Some eighteen months ago, suitable panels were installed and both these stations equipped with Bertram Thomas high-speed breakers, with the associated metering and relay equipment. The three new and three other original substations were already equipped with modern

Fig. 5.—A trolley-bus turning into Richmond Hill

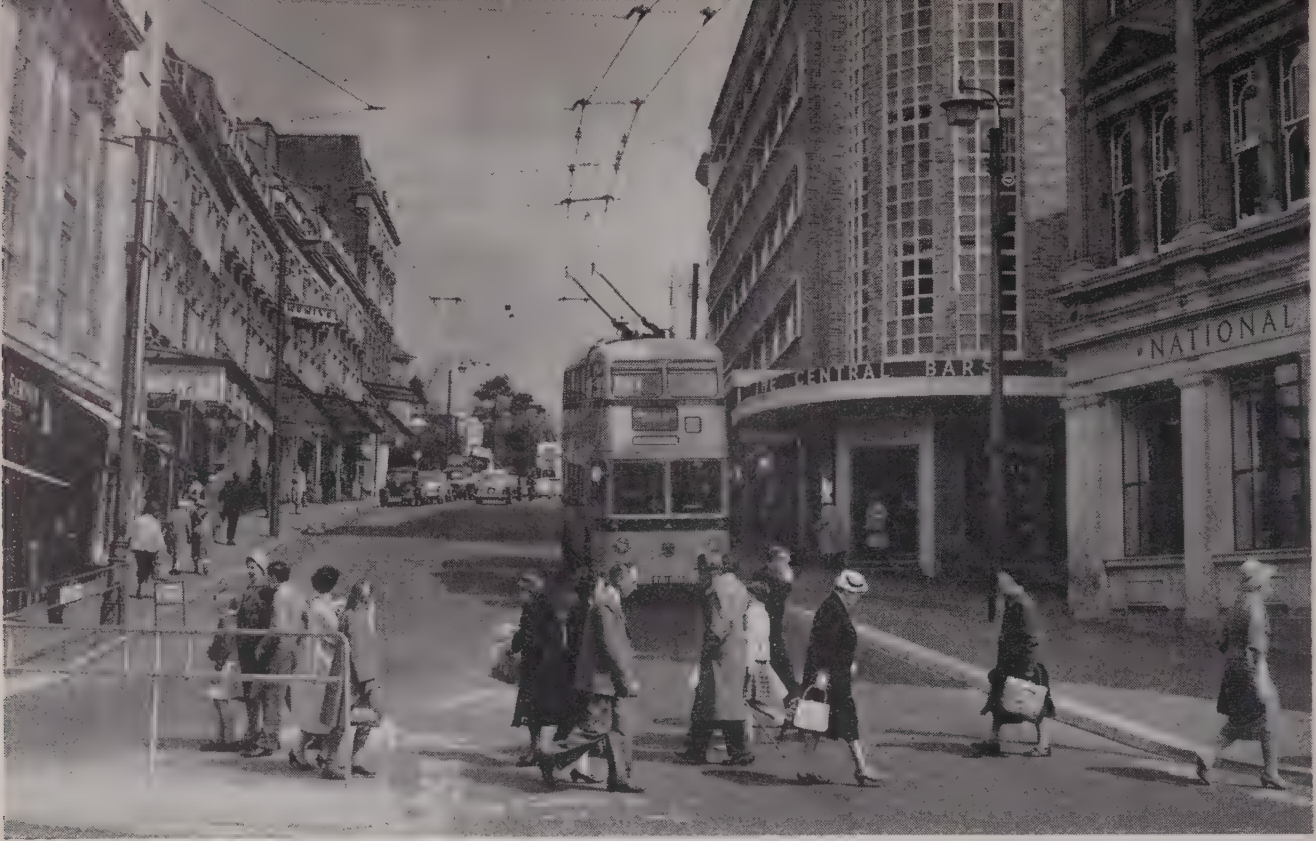
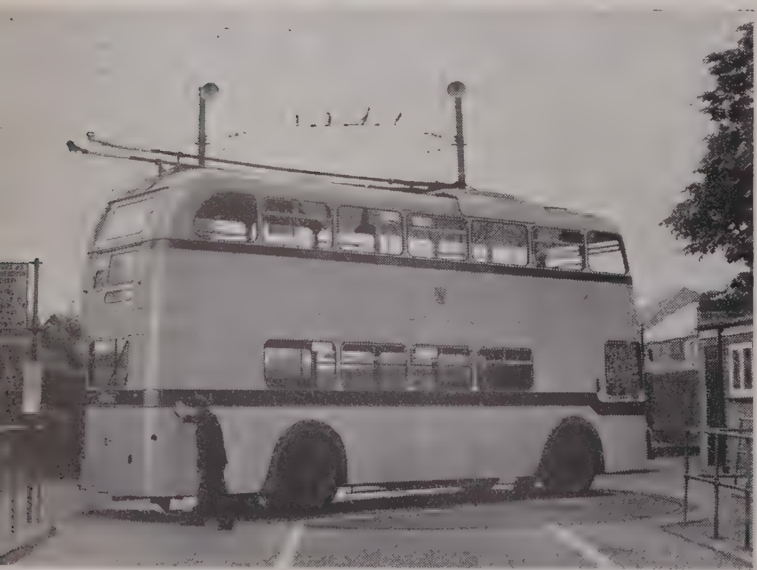


Fig. 6.—Descending Richmond Hill

d.c. switchgear. The whole system is earthed at one point, at Southcote Road substation.

A further problem encountered following the change-over of supply was the question of regeneration, because although the post-war vehicles were of the non-regenerative type, 79 of the original Sunbeams were still operating. To absorb any current returned to the line by early morning buses or last buses at night, when there was no other equipment in service, ballast resistances were fitted in four of the substations. Fig. 3 shows the bank of resistances and associated relay panel by the side of the d.c. panel in Southcote Road substation. By suitable coupling of the stations, regeneration was catered for on all sections of the system in addition to the further advantages obtained from coupling of various feeders. The immediate post-war vehicles and those more recently acquired are all fitted with non-regenerative equipment arranged to give two stages of rheostatic braking before the air brakes operate. The new two-axle trolley-buses are much lower in weight and require less maintenance which should lead to economies in power consumption as well as in maintenance costs.

Fig. 7.—The turntable at Christchurch



Overhead System

Over the years considerable extensions have been made to the overhead system. As development has taken place in the borough, new routes have been authorised. The overhead system also carries much of the street lighting. This has many advantages, especially to the ratepayers.

At present, the overhead line consists of 24·8 miles of double wiring with 4·24 miles of single wiring. Bournemouth, like most other large towns, suffers at times from heavy traffic congestion, but by providing suitable loops at busy points, one vehicle is allowed to pass others which may be stationary, either loading or unloading. An example of this is shown in Fig. 4 where automatic frog operation enables a vehicle to enter the loop or carry straight on.

A further feature of the overhead system is the use of double wiring at busy road junctions similar to the Lansdowne, where vehicles meet heavy traffic and divert to serve the various routes. This double wiring is taken some distance from the road junction where automatic frogs are installed and a driver is able to switch over to a through line before mixing with the traffic negotiating the island.

Mention should be made of the acute left-hand turn from the town centre leading to Richmond Hill and Fig. 5 illustrates a vehicle negotiating this turn into Richmond Hill. Fig. 6 shows a vehicle descending the hill on entering the town centre. All vehicles are equipped with a coasting brake and this must be engaged at a compulsory

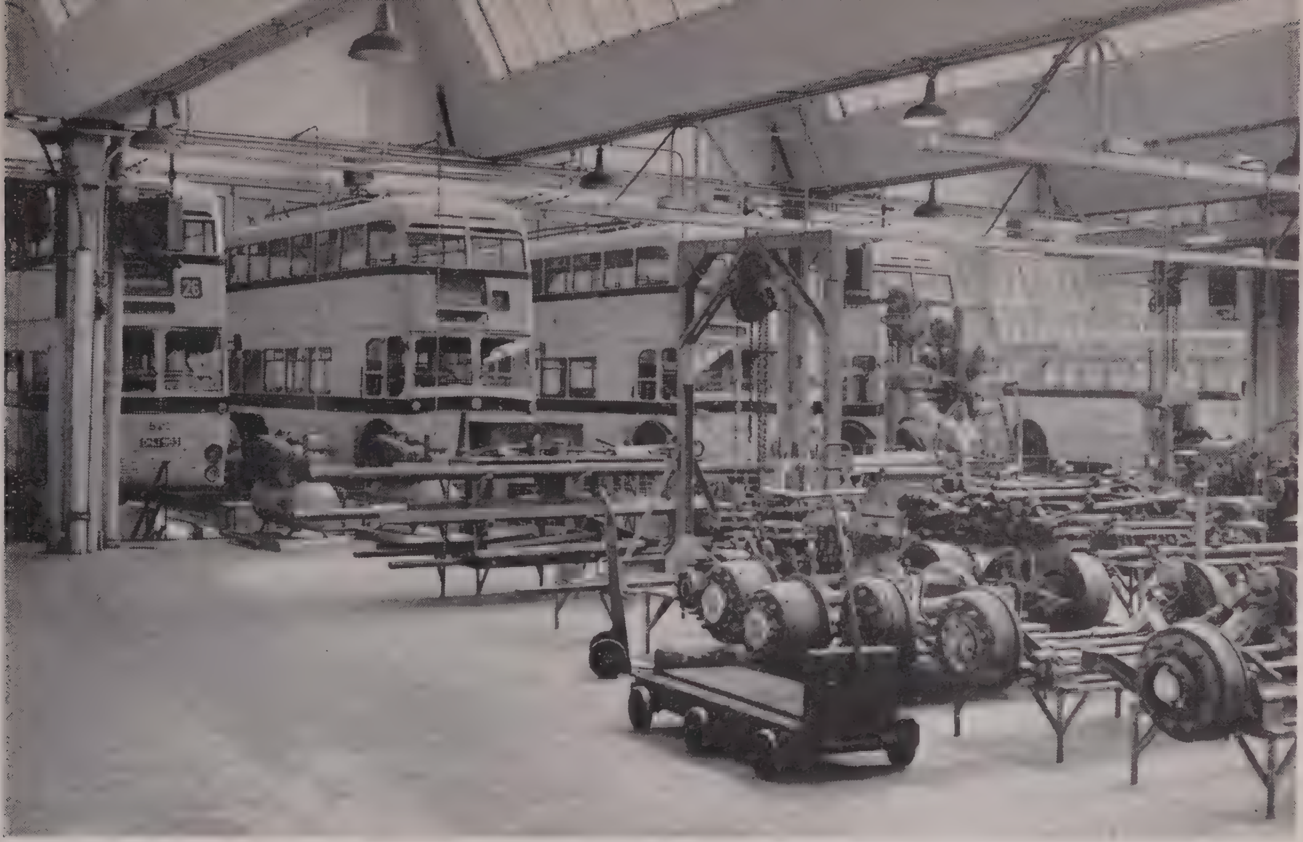


Fig. 8.—Part of the Castle Lane workshops

traffic stop, at the top of the hill before descending, controlling all trolley-buses to a speed of 6-8 m.p.h.

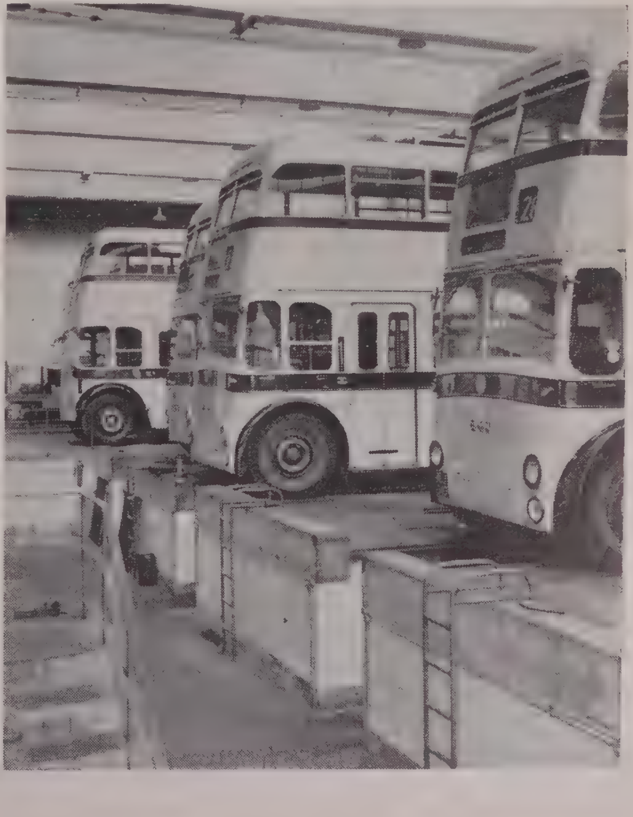
The trolley-bus system also extends into the borough of Christchurch and when the vehicles were required to turn near Christchurch Priory, the problem arose of how best to do this. There was no space to make a natural turn and no alternative road, but a lease was obtained on a small yard adjacent to the Department's waiting room. Here a manually-operated turntable was installed and this has now functioned satisfactorily for the past 25 years. Fig. 7 shows a vehicle being turned at this point. No great effort is required to bring the vehicle back into position and with the booms changed to the outcoming line the vehicle loads up for the return journey.

The main workshops at Castle Lane are shown in Figs. 8 and 9. This new garage and workshops were first occupied in 1953 and included in the most up-to-date layout are full maintenance and overhaul facilities for the Department's fleet of vehicles. The garage building itself gives a column-free covered space of 45,000 sq ft, being 300ft long by 150ft wide and providing good accommodation for 99 vehicles.

The workshops are divided with blocks into the various sections, viz.:—Maintenance, machine, body and paint and stores. The maintenance section contains a series of ten pits connected to a master pit and two isolated pits. All the pits are lined with glazed tiling and lighted by fluorescent lamps. A separate building exists for washing. Canteen facilities are provided in a further separate block and extensive playing grounds are attached to the depot.

In addition to trolley-buses, the Department operates a large fleet of motor-buses on routes where it has not been felt desirable, for various reasons, to extend the traction system or where it was not possible to do so. The policy of the Council to continue with the trolley vehicle system is borne out by the purchase of 64 vehicles in recent years. As stated earlier in this article, most of the original vehicles have already completed well over 750,000 miles, and some of them are still in service on daily schedules. There is no doubt that the Council's wisdom in adopting trolley-buses has been well proven and whatever others may do, its confidence in trolley-buses for the future is more than justified.

Fig. 9.—Trolley-buses over the pits in the Castle Lane workshops



I.E.E. ANNUAL REPORT

THE report of the Council of the Institution of Electrical Engineers for the year ended 31st March last, presented at the 88th annual general meeting on 19th May, shows that the total membership now exceeds 46,200, of whom more than 24,300 are corporate members. There has recently been a steady growth in membership and the overall increase of 1,678 in the period covered by the report has been exceeded only once during the last ten years. The Membership Committee considered 5,589 proposals during the year and 2,708 new members were elected. There was an increase of 530 in the number of graduate members, bringing the total to 14,545, even though 735 were transferred to the class of associate members, and there was an increase of more than 34 per cent in the number of students elected. Three new admissions bring the number of women associate members to 34, the total for all classes of membership being 73.

Recommendations for amendments to the by-laws and for revised rates of membership subscriptions and entrance fees were discussed at three special general meetings of corporate members, at two of which polls were taken on specific resolutions for increases in fees and subscriptions. Confirmation of final proposals for increased subscriptions was obtained by 4,701 votes against 736. To consider points raised at these meetings and others received in writing from members, a Special Advisory Committee was arranged to review the suggestions and recommend improved methods of communication between members and the Council.

A high level of activities has been maintained. Five symposia and conferences are at present being arranged, one of which is the third International Conference on Medical Electronics, which the Electronics and Communications Section is organising in association with the International Federation for Medical Electronics. During the year, 1,550 meetings were held in London and the local centres, an increase of 131 compared with 1958-59. Seventeen ordinary meetings were held in London, with an average attendance of 220. The membership of the specialised sections, the number of meetings that have been held and the average attendances are shown in the following table.

Section	Membership at 31st March	No. of Meetings	Average attendance (figures for previous year in brackets)
Electronics and Communications	6,171	40	477* (177)
Measurement and Control	3,337	15	149 (148)
Supply	5,601	10	111 (141)
Utilisation	4,946	8	86 (126)

* Includes Transistor Convention, Earls Court, attendances.

The ten local centres, 11 sub-centres and 13 specialised groups held 380 meetings during the year, an increase of 37 compared to the previous year.

New training regulations have been introduced following the by-law revisions which were agreed in April, 1959. These regulations state clearly the requirements for this important part of an engineer's preparation and are so written that a candidate may submit his training for assessment at any time after he has qualified for graduate membership. The education and training advisory services received more than 5,000 letters during the year, nearly 2,000 in the peak period in September and October.

Steady progress has been made in the building reconstruction programme. The alterations to the third floor and the library improvements comprising the first phase have been completed, as has the first stage of the work in the lecture theatre, which was brought into use in its present condition in time for the session's opening meeting. A new ceiling, designed to improve the acoustics, is now being incorporated, and the new side wings and galleries should be completed to enable the theatre to be used in its final form early in September.

In September last year, the then president, Mr. S. E. Goodall, and the secretary, accompanied by their wives, attended the jubilee celebrations of the South African Institute of Electrical Engineers in Johannesburg and in the course of their journey were present at meetings arranged in Uganda, Kenya and Rhodesia, and in Durban and Cape Town.

Conference for Professors

SOME time ago the Electricity Council organised a Conference of University Professors at which a number of lectures were given by leading members of the electricity supply industry. About forty professors attended. Sir Josiah Eccles, deputy chairman of the Council, who presided, explained the " set-up " of the industry and the functions of its components, and referred to the university research teams which it operated.

Mr. F. H. S. Brown, deputy chairman of the Central Electricity Generating Board, opened with a lecture on " Trends in Generation Including Work on Nuclear Power Stations " in which he surveyed in some detail the fuel situation, the design and operation of plant, and the new considerations involved in the production of nuclear power. Afterwards questions were answered by Messrs. E. S. Booth and J. W. H. Dore.

" Problems of Transmission and Distribution " formed the subject of a two-part lecture by Messrs. J. L. Egginton (transmission) and J. D. Nicholson (distribution) who also answered questions put to them. Mr. L. Rotherham then dealt with " Research Problems of the Supply Industry " and mentioned the work carried out at the Leatherhead Laboratories. Dr. J. S. Forrest participated in the subsequent questions and answers session.

" Organisation for Design and Construction of Power Stations " was briefly covered by Mr. E. S. Booth and the Bradwell nuclear generating station by Mr. W. H. C. Pilling.

The full proceedings of the conference (well illustrated) have now been published, with a list of members and biographical notes on the supply industry representatives. The whole forms a useful record and source of reference. Copies are obtainable, at 10s each, from the Education and Training Branch of the Electricity Council, Winsley Street, London, W.1.

A New Prospect of Lighting

DISCUSSIONS AT I.E.S. HARROGATE SUMMER MEETING

IN the usual conference pattern of formal papers and discussions the great majority of delegates can play only a passive role. And even in many societies the opportunities for a member to make his views felt on any particular subject are limited. At their biennial summer meeting last week the Illuminating Engineering Society overcame this disadvantage by devoting one day to a series of parallel discussions on subjects under review by the Society's technical committee. The arrangement was generally acclaimed as a great success. The meetings were fully attended and when the groups reported back to the plenary session they all said they could have happily continued their discussions for longer than the hour-and-a-half allowed.

Success did not come by chance. Much hard work had gone into the preparation and early circulation of notes for the guidance of those taking part in the discussions. A contributory but important factor was the knowledge that the discussions had a specific aim since what was said will be of assistance to the panels operating under the technical committee and in particular the one at present engaged in formulating a new I.E.S. Code. There was also evidence during the meeting of a growing realisation that an important stage has been reached in the history of lighting—a stage, some would say, no less significant than the invention of the incandescent lamp.

The work of the lighting engineer does not consist merely in supplying a source of light or a certain quantity of illumination, though too often this is all he may be allowed to do. To talk of an installation solely in terms of foot-candles is unrealistic because, although it may ensure a certain minimum standard, it bears little relation to the quality of the light provided and its suitability for the purpose for which the room or factory will be used. It is as though an architect were to describe his design for a building not in terms of its appearance and the way he had utilised the available space, but only gave figures for the load-bearing strength of the walls. It is as unimaginative as a menu expressed in calories. A client of an architect or a diner in a restaurant is principally concerned with the quality of the building or meal he receives in relation to the purpose for which he wants it and the price he is prepared to pay. He is not necessarily interested in how the end is achieved; he is content to rely on the skill and efficiency of the architect or cook he has selected. Similarly, a person buying a lighting installation should be encouraged to consider the overall quality of the lighting effect he will obtain rather than, as at present, getting involved in the technicalities of how much light will be provided.

Task Analysis

It was therefore significant that in the discussions on "Visual Task Analysis" there was agreement that lighting engineers should offer a job not based on illumination levels but rather on the quality of lighting for seeing. It was suggested that lighting engineers might now more appropriately call themselves "seeing engineers" and though this title is unlikely to be adopted it effectively illustrates the change in emphasis now taking place. The implication is that the lighting engineer must now look more critically at the particular task which confronts him and at the same time give greater consideration to the appearance and effect of the whole surroundings.

Job or task analysis is practised systematically by industrial engineers and is within the province of so-called "human engineering" and "ergonomics." Unfortunately, analysis has not been adequately pursued with reference to the demands jobs make upon visual capacities and to those job characteristics which affect the prescription of proper lighting for them. Classifications of jobs have been made for the purpose of laying down standards of occupational vision and lighting, but these rest a good deal upon experienced judgment rather than upon appropriate measurements. It seems obvious that, just as proper prescribing in medical practice depends upon correct diagnosis of the condition to be treated, so the prescription of proper lighting for visual tasks must depend upon adequate diagnosis of these tasks. As was pointed out in the discussion, the task for which a typist requires light is not so much to see the keys of her typewriter as the scrawl of the manucript she is copying which may be lying in shadow on the surface of her desk.

Medical Analogy

Modern medical practice is making increasing use of measurements rather than clinical impressions of the patient's state and modern lighting practice ought also to be based upon more precise knowledge of what needs to be revealed. The new speciality of industrial ophthalmology and ophthalmics is as much in need of the results of visual task analysis as is lighting engineering, for the reason that the demands of tasks upon visual resources vary with their characteristics and how these are lighted. However, not all of the features of visual tasks which are relevant to ophthalmics and ergonomics need the attention of the lighting engineer. Primarily, he needs to know the extent of the field of view necessarily involved in doing the job, the "response" of its component surfaces to lighting, the dimensions of details requiring critical scrutiny and the distance at which these details have to be seen, as well as whether they are still or moving.

It is clear that these requirements involve a considerable widening of the scope of the lighting engineer's activities. Also external factors become of increasing importance. If the desired result is to be obtained, the lighting engineer must ensure that his work is not spoilt by the choice of decoration or the finishes on equipment and furniture. In other words, he must co-operate with architects and decorators to arrange a suitable colour scheme and persuade manufacturers that highly reflective surfaces, such as the panel of a power station switchboard or the chromium trim on a typewriter, should be avoided because they cause glare and a consequent loss of visual efficiency. The difficulty is that the lighting engineer is either called in too early, when the placing of desks or machinery has not been decided, or too late, when his ability to provide a satisfactory installation is compromised by the arrangement of the wiring or the siting of furniture and working positions. Delegates agreed that there was a need for more flexibility in the provision of power supplies for lighting. It was also recognised that much more information is required on how various levels of illumination are accepted, on the distribution of time spent in critical seeing, and on the associated hazards reducible by lighting.

Reducing Glare

As levels of illumination are increased the problem of glare becomes more insistent. During the last year or so the Luminance Study Group of the I.E.S. has directed its efforts towards studying limits of glare for general lighting installations. First, it was established from subjective assessments of about one hundred installations that a sensible relationship exists between these and objective measurements, if the latter are used in one of the accepted formulæ to determine glare constants. The next step was to devise tables giving glare constants for any fittings used in regular formation, lighting rooms of various sizes and with different reflection factors. These tables must include all the more orthodox types of fittings used in general lighting, and it must be easy to relate closely any actual fitting to the standard tables. The final aim is to compile a Luminance Code which will set limits to the glare constant admissible in various interiors—since a degree of glare not acceptable in one set of circumstances may be quite acceptable when these are changed.

It was recognised in the discussion that this work is concentrated on what may be described as the negative aspect of luminance, i.e. the restriction of glare. But it is clear that there is an urgent need for some guidance, even though a more positive code must wait until further data have been collected. Another interesting aspect of glare touched on, and which delegates suffered in their own meetings, is that from windows. Supplementary lighting, which may actually be reduced after dark, can do much to minimise this.

Providing a suitable level of illumination with an absence of glare does not complete the lighting engineer's task. Much can be done to enhance the appearance of an interior, and thus make it a pleasanter place to work or live in, by the use of modelling and colour. A " dull " interior, where there is insufficient contrast of light and shade or where the modelling is mainly vertical, can be " brightened " by the introduction of directional lighting from the side. Though such techniques are well established in floodlighting, delegates agreed that using them to introduce interest and vitality into ordinary interiors presented greater difficulties. Nevertheless, it was a challenge that they appeared eager to accept for the possibilities are considerable and rewarding. There is scope, for instance, for more flexibility so that installations in, say, restaurants, can be changed to suit different functions, or at different times of the day. The use and variation of colour in lighting has not kept pace with the imaginative use of colour in contemporary interior decoration. Since the use of colour and modelling is certain to increase, there was a demand that more space should be given to these subjects in the new code.

Maintenance of Lighting Installations

However well an installation is designed initially its efficiency will decline unless it is properly maintained. And the reduced efficiency will result in economic losses. Apart from the more obvious depreciations due to the collection of dirt and the fall in lamp output, changes may occur in the characteristics of materials used in controlling and directing the light, and defects arise in electrical and mechanical components. Cleaning is also necessary for reasons of health and appearance.

The discussion on this subject revealed that surprisingly little is known about the ways in which maintenance is carried out and how cleaning schedules are arranged. It was agreed that there is an urgent need for reliable information based on maintenance records from a wide range of industrial, commercial and other lighting installations so that manufacturers can advise on the preparation of suitable schedules before an installation is put into use. More information is also needed on the external factors which affect a maintenance schedule. Much importance was attached to simplicity and quality in luminaires and integrated lamps and reflectors, dust-proof covers and ventilated systems were mentioned as examples of how the designer could help to reduce the frequency with which cleaning is required. The need for careful attention to the accessibility of luminaires was also stressed. Higher initial installation costs may well be offset by reduced maintenance costs and by freedom from interference with production. As a general rule the frequency of maintenance will be determined by relating maintenance costs to the losses due to reduced illumination.

Where luminaire design and accessibility have been given due consideration, the removal of dirt and lamp replacement will become the major items in any maintenance schedule. The practice of group replacement was generally commended. Replacement of a single lamp may cost between 7s 6d and 18s 6d and in Blackpool group replacement has cut down casual outages to one-tenth of the previous figure.

The great problem, it was agreed, was how to put over the maintenance story to industry. Lighting engineers have concentrated too much on designing installations that are perfect only at the time of switching on. A service of fully qualified lighting maintenance contractors would be one solution. But in the meantime the Society could do much by collecting information on current practices and making it readily available.

Floodlighting and Calculations

An essential difference between the floodlighting of buildings and industrial area floodlighting, such as railway sidings, is that the latter is viewed from within, and in the session on this subject it was pointed out that the too rigid use of horizontal illumination as a criterion was a weakness as it did not necessarily represent the effectiveness of the installation. It was announced that an I.E.S. technical report on industrial area floodlighting is being prepared.

A.E.I. RESEARCH LABORATORY

The main building houses the administration offices, three sections of the Laboratory and the restaurant

On 17th May Viscount Chandos, chairman of Associated Electrical Industries, Ltd., officially opened the company's Research Laboratory at Harlow, Essex. Started some two years ago by Siemens Edison Swan, Ltd., the Laboratory now carries out research work for the product divisions and companies managed by A.E.I. (Woolwich), Ltd. These comprise the Cable, Construction (Cables & Lines), Radio and Electronic Components and Telecommunications Divisions and A.E.I. Plastics (Aldwych), Ltd., Henley Foundries, the London Electric Wire Co. & Smiths, Ltd. Lord Chandos was introduced at the ceremony by Dr. J. N. Aldington, managing director of the Woolwich group, who also introduced the recently appointed director of the Laboratory, Dr. M. E. Haine.

There are nine sections of the Harlow Laboratory. The phosphors and photo-conductors and transistors sections are housed in the main building with the administration offices and restaurant facilities, the vacuum physics and image tubes and electron optics sections are housed with the glass and model shops in a two-storey building; while two single-storey structures accommodate the metallurgy and chemistry and materials sections. Harlow is also responsible for the administration of the telecommunications sections in a separate laboratory at Blackheath. The Laboratory has a staff of some 250 at present, although there are facilities for an expansion to treble this figure if required. Sponsored work from outside organisations is also undertaken, some of which has been concerned with transistors and photo-conductors and the development of cadmium sulphide crystals sensitive to nuclear radiation which may be used in detectors. A training scheme is in operation in which school leavers are instructed in laboratory practice in conjunction with a technical college course.

A leak detector mass spectrometer being used to check the glass/metal and cold weld seals of silicon diodes

A number of exhibits and demonstrations had been arranged to illustrate something of the work being carried out. One such display illustrated the technology associated with the extrusion of dielectrics to form cable insulation, and a method using ultra-violet radiation to improve the characteristics of thermoplastic materials, making them suitable for high-temperature applications by forming additional bonds between the groups of atoms, was shown. Equipment was also displayed for obtaining information on the dielectric resistivity of cables for the projected d.c. cross-Channel power link. Work being undertaken by the metallurgy section included investigations into alloying reactions in semiconductors, properties of magnetostrictive alloys and metallurgical factors affecting electron emission.

An exhibit by the image tubes and electron optics section demonstrated the use of an image intensifier tube enabling a high magnification electron microscope image to be viewed directly on a cathode-ray tube screen. The normal fluorescent viewing screen of the microscope is

Work on image intensifying equipment is carried out in the image tubes and electron optics section

removed and the image falls on a thin layer of selenium which has an electron transparent metallic signal plate on the upper surface. Each incident high-voltage electron can release up to 2,000 electronic charges in the selenium which are driven to the lower surface of the layer by a positive potential applied to the signal plate. The intensified image on the lower surface is scanned by an electron beam which erases the charge point by point, enabling signals to be taken via the signal plate, amplified and displayed.

The use of mass spectrometer techniques in determining the range of leakage rates and the largest leak that can be tolerated in electronic tubes was shown in the vacuum physics section. In the magnetic materials section samples taken from the various stages of ferrite preparation, including mixing, initial firing, regrinding, pressing into the required form and final firing at 1,250°C, were on view, with diagrams illustrating the approximate equivalent circuits associated with ferrite-cored coils and apparatus to measure such factors as resistivity, dielectric constant and inductance.

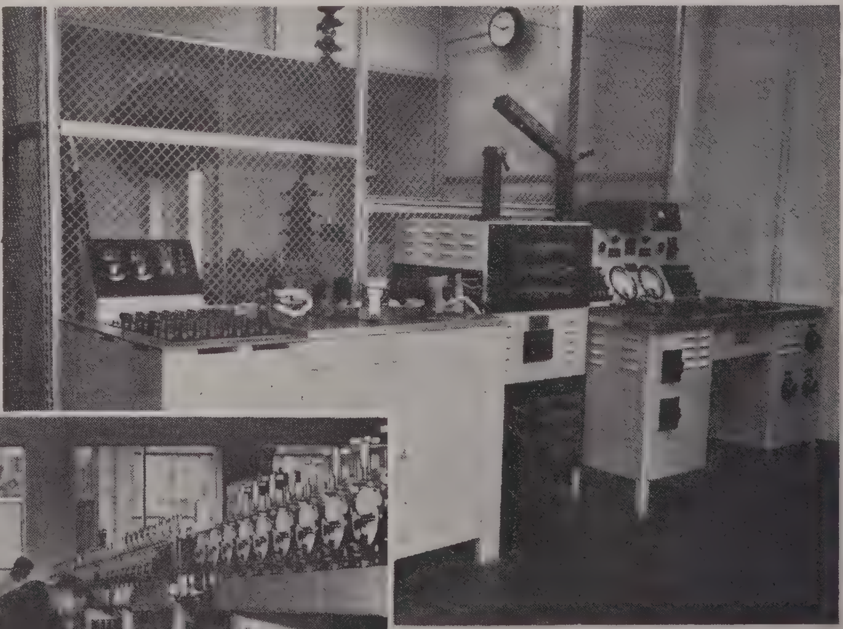
The problems of stabilising, and producing consistently, a transistor characteristic may be divided into surface, material, diffusion and alloying studies. Two methods of investigating surfaces, through their electrical properties using the field effect and by studying their structure using an all-glass electron diffraction camera under construction in the Laboratory, were shown. A method of assessing the perfection of a semiconductor material using the rate of decay of the photoconductivity was demonstrated, as was a technique based on optical interference for measuring the penetration depths of impurities into surface layers.

METER TESTING STATION

ON 17th May Mr. C. T. Melling, a member of the Electricity Council, officially opened the Eastern Electricity Board's new Friern Barnet meter testing station. This station, with a similar establishment in Norwich, replaces the 26 testing stations which were vested in the Board at nationalisation. The premises are equipped for the maintenance and certification of some 140,000 meters annually, received from the Chilterns, Essex and Northmet Sub-Areas, and for the renovation of time switches, relays and portable testing instruments. Facilities are also provided for conducting qualitative tests on insulating oil and safety tests on rubber gloves. The staff totals 136, under Mr. F. G. Talbot.

Among the meters which are reconditioned and calibrated are single- and polyphase two-rate meters used with a time switch to record day units and cheap units at night under the night and day and block weekend rates, single- and polyphase credit meters used for domestic and industrial premises and firms on a two-part tariff and block rates, two-part tariff prepayment meters used in association with domestic two-part prepayment rates and trivector meters used in conjunction with the Board's maximum demand tariff. Dielectric testing up to 100 kV and testing 11 kV voltage transformers is carried out in a high-voltage section, and there is a separate laboratory for the meter examining staff of the Ministry of Power. Rooms are provided for chemical and steam cleaning operations, and for pivot and jewel work.

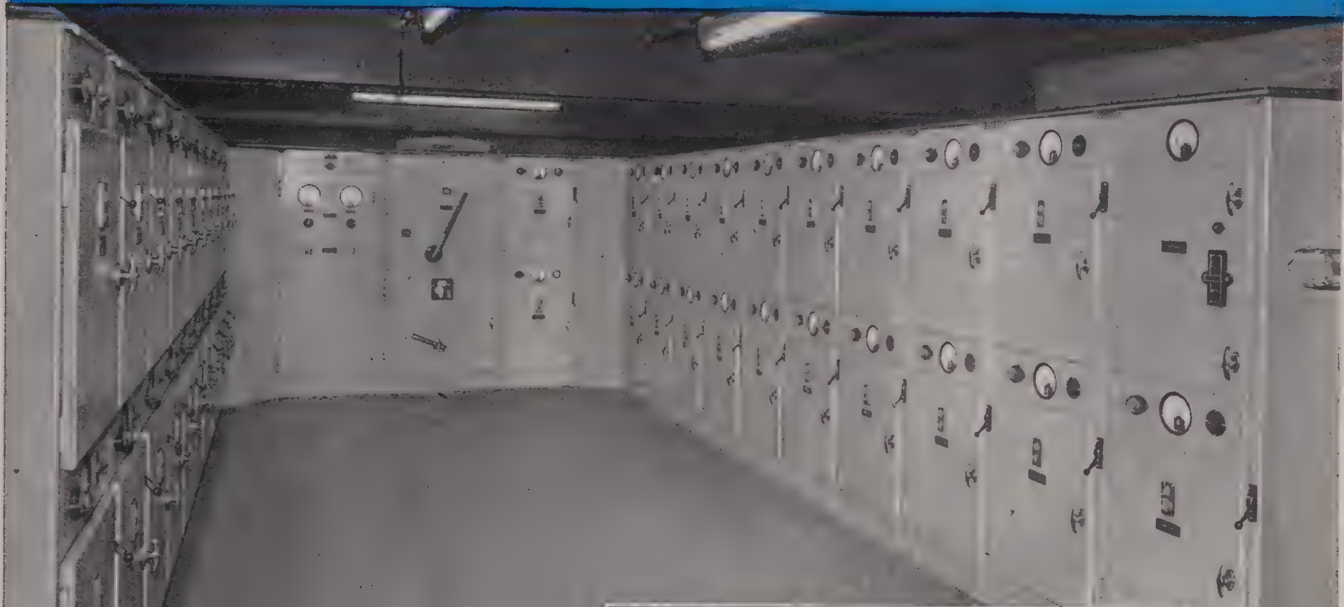
The single-storey building has a floor area of some 5,525 sq ft and is equipped with electric floor warming using the Thermodare system of withdrawable cables laid in the base concrete and covered by a 2in screed. This has a loading of approximately 11 W/sq ft of floor area available for heating and a total capacity of 108 kW, providing an ambient temperature of 65°F and using an off-peak supply. The floor temperature is controlled at 80°F. A forced air ventilation and additional heating system has been provided. The Board's chief engineer, Mr. C. C. Hill, was responsible for the design, construction and equipment of the laboratories, the architect for the station being Mr. J. W. Lee.

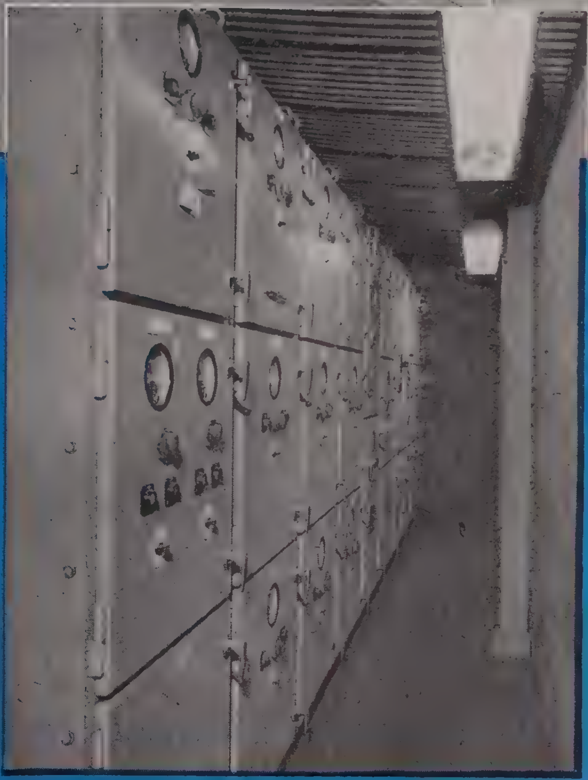


Above: The high voltage section. Left: Part of the meter inspection laboratory

CONTACTOR TYPE SWITCHGEAR

to 1000 AMPS.





▲ Multi-motor contactor switchboard supplied to the N.C.B. for a FROTH FLOTATION PLANT.

Multi-motor contactor switchboard supplied to the N.C.B. for a WASHERY PLANT. ▶

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VIEWS on the NEWS

By REFLECTOR

I HAVE often thought that the *Economist* takes too cautious a view of the prospects of the electrical industry and so does an American writing to that journal. Mr. Fullerton Miller, of Columbus, Ohio, says that it has been axiomatic in America for the last 70 years that electric power demand doubles itself every ten years and this decade is not expected to prove an exception. Consequently preparations are in hand to meet the expected demand, including experimentation with various types of nuclear power plant. He goes on to say: —

> "I cannot reconcile the waning importance allotted your electric power in the face of England's accelerating industrial plant expansion. Pulling the Fuel Ministry down from Cabinet rank and cutting back the timetable for nuclear power production in the middle sixties are evidences of undue conservatism; so are your articles."

Mr. Miller thinks that this may result in "resting" at laboratory level and failure to provide the "significantly cheaper fuel" which an exporting nation needs to make it competitive.

* * *

Sir Christopher Hinton, chairman of the Central Electricity Generating Board, whose concern for the preservation of amenities in the carrying out of his difficult task of providing power stations is well known, is able to claim one point, at least, on the credit side. Addressing the recent annual conference of the Electrical Association for Women at Folkestone, he said that the site chosen for the Dungeness nuclear power station was isolated and unbeautiful. The power plant would provide a dominating and challenging feature and would improve the character of the headland. Knowing Dungeness, I can believe this and I am not sure that some other places will not be improved by the imposing new stations—Bradwell (Essex) for instance.

* * *

Reporting the conversion of the rest of the Albert Hall lighting from gas to electricity, a daily paper recently stated that "the last 1,100 Victorian gas mantles which have been the Albert Hall's secondary lighting since 1871 are to go." I have heard a lot about long-life lamps lately but we have nothing to beat this.

* * *

Wordsworth's heart leaped up when he beheld a rainbow in the sky and in similar fashion most of us are stimulated when we see floodlit buildings and decorative lighting. In India, too, they appreciate this sort of thing and a short time ago there was a Republic Day (1960) Illumination Contest in Bombay when a number of buildings were specially lighted or floodlit. In reporting on the contest, and publishing pictures of the prize-winning schemes, the *Indian Electrical Contractor and Trader* rightly said: —

> "One should remember that illumination on festive occasions is for gaiety and the overall effect should be one for dispelling darkness from objects and moroseness from the mind."

* * *

Remaining on the subject of lighting, I may mention the recent case of a Chelsea lady who brought an unsuccessful action against the Borough Council when, as a result of a conversion from gas to electric street lighting, she was prevented from sleeping by a bright lamp outside her house. In refusing her an injunction against the Council and dismissing her claim for £100 damages, the County Court judge said (as reported by *The Times*) that her husband apparently regarded the Council as being "as sinister as the wicked magician in the Arabian Nights tale who offered new lamps for old." But who would try to summon a genie with a gas lamp?

* * *

In recent years the cable industry has passed through a difficult patch. Half a century ago things were much the same. In a speech at the annual meeting of Callender's Cable & Construction Co., reported in the *Electrical Review* of 27th May, 1910, Mr. T. O. (later Sir Tom) Callender said of the preceding year: —

> "It was a year full of trouble and disappointment—full of an immense amount of work which did not bring a proportionate return either in orders or in profit. On the whole the shareholders had to congratulate themselves on the results which had been obtained. When one looked at what had been done by others in the engineering line, in cable business, and in kindred enterprises, their company, in the profit they had been able to secure, stood out fairly well. Throughout the whole of this country and in a good deal of the rest of the world, including the Colonies and many foreign countries, the business upon which they mainly depended had been almost at a standstill. That had been brought about by various causes, and first among them was the use of the metallic-filament lamp, but although that had hit them very hard during the past few years, it was likely to prove a great advantage in the future."

That lamp also worried the electricity supply authorities: it was so much brighter and more economical than its forerunners.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Psychology and Design

APPARENTLY out of the blue, your leaderette of 13th May refers to the attention now being paid to the appearance design of electrical equipment. I only wish I could concur fully with your final smug summing up that . . . "electrical engineers are fully competent to deal with their own problems."

A tour of the Electrical Engineers' Exhibition would soon dispel that vision, and let it not be thought that our colleagues in telecommunications are excluded from criticism. I dislike the segregation of appearance design from engineering. The specialist in ergonomics (human engineering), or industrial designer, or both, must be part of the design team working alongside the engineer. Only by this close co-ordination will the final result be of maximum benefit to the user. The training of an electrical engineer does not unfortunately include art or sculpture; if it did it would help him to shape an article to suit its use (a handle for switchgear perhaps), or choose a colour (as a background for maximum legibility)—these points can be well taken care of by the industrial designer and the psychologist respectively.

There is still a great deal of electrical equipment that is not as well designed as it could be. Why should the manufacturer's name be more legible than the functional instructions on a piece of switchgear? Why should controls be in a neat symmetrical arrangement to suit the whim of a draughtsman? Meter design has improved, but why are too many still not readable at an acute angle, have figures and pointers illegible from a distance and makers' names on the scale conflicting with "Volts," "Watts," *et al.*? Are control knobs aligned with the meters associated with them (take a look at tape recorders), are they labelled (look at radio or television sets), are they of shape and size which indicate their relative importance or function?

No, Sir, I will not continue to list our failings, but merely say that the electrical engineer cannot afford to be complacent, the industrial designer should be welcomed as an ally, and not as you suggest someone to place a rubber stamp on the electrical engineer's capacity to do everything.

London, S.E.10. PETER E. M. SHARP.

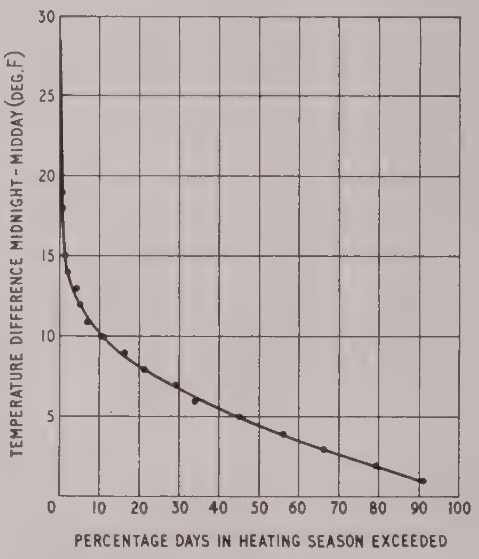
Floor Heating and Radiator Systems

THE letters in your issue of 13th May impel me to defend Mr. Hazel although I imagine that he is quite at ease in the role of Daniel.

Since its inception I have followed the development of electric floor heating with interest and I have been amazed that in the multitude of more or less technical papers describing installations I have not yet found one which gives a straightforward comparison of costs with other forms of heating. For example, Mr. Houldridge quotes the cost of running an installation but gives no indication of the quantity of heat that was obtained. One is left with the subjective opinions of "enthusiastic residents" rather than any rational measure.

Mr. Ackery raises the important point that most under-floor electric heating provides only background heat. This may be all that the residents desire, but such installations should not be compared with systems providing full central heating. Yet this is frequently done by over-enthusiastic advocates of under-floor heating.

The vagaries of the British climate do not help the case for off-peak heating of this kind. However perfect the automatic control it must make up its mind how much heat to provide between midnight and dawn. The accompanying curve shows the difficulty in forecasting the temperature of the following day and indicates that if the controls were set to provide the conditions normally specified for comfort under the worst circumstances, on many days and in spite of the admittedly large thermal capacity of buildings, there must be considerable over-heating.



Comparison between outside temperature difference midnight-midday for heating season 1956–57 and frequency of occurrence plotted as percentage of days when temperature difference is exceeded. (Source: Meteorological Office charts)

While I have no desire to discourage the development of a new form of heating that offers many amenities I believe that a very critical investigation should be made before embarking on any major scheme of electric floor warming. This may have been lacking in the case of some completed during the last few years. The ultimate result may be to discredit this form of heating.

London, S.W.1. C. L. CHAMPION, M.I.E.E.

Manchester Electronics Exhibition

The annual Electronics and Instruments Exhibition and Convention, organised by the Northern Division of the Institution of Electronics, will be held from 7th to 13th July at the Manchester College of Science and Technology.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. D. T. L. Rettie, M.A., has been appointed deputy managing director of A.E.I.-Hotpoint, Ltd. He is also joint managing director of A.E.I.-Gala, Ltd. (the export company of the Hotpoint Group). Mr. Rettie was appointed marketing director of A.E.I.-Hotpoint in 1956. **Mr. C. J. A. Cooper,** F.C.A., has been appointed comptroller of the company. From 1939 to 1940 he was assistant to the manager, Electrical Manufacturers Finance Co., Ltd., a subsidiary of A.E.I., and accountant of A.E.I.-Hotpoint, Ltd., until 1941. He became secretary in 1945 and was appointed chief accountant in 1956. **Mr. C. A. Ganderton,** B.A., becomes manager of the Marketing Department. He was appointed marketing manager, home laundry, in December, 1957, became manager of the Portable Appliances Division in 1958 and general marketing manager last July.

Mr. D. T. L. Rettie

Mr. C. J. A. Cooper

The United Kingdom Atomic Energy Authority announces the appointment of **Mr. B. S. Smith** as head of the Isotope Research Division of A.E.R.E., Harwell. Mr. Smith was formerly head of the Health Physics Division at Harwell, and his successor in that post is **Mr. N. G. Stewart,** at present at the Authority's Dounreay Experimental Reactor Establishment. Mr. Stewart will take up his new duties on 1st August.

The Minister of Power has reappointed **Sir Anthony Bowlby,** Bt., of Edgbaston, Birmingham, as a part-time member of the Midlands Electricity Board.

The annual general meeting of the **Ipswich and District Electrical Association** was held on 16th May. The chairman, Mr. J. A. Robertson, stated that the Association had enjoyed a successful year and membership had increased. Following his report, Mr. Robertson inducted the new chairman, Mr. R. L. Thurlow (area manager, Cryselco, Ltd., Bury St. Edmunds), with the chain of office. The following officers were also elected:—Vice-chairman, Mr. R. W. C. Stebbings (chief commercial officer, Eastern Electricity Board, Suffolk Sub-Area, Stowmarket); hon. secretary, Mr. W. F. Rowberry (A.E.I., Ipswich); hon. treasurer, Mr. W. H. Howell (showroom manager, Eastern Electricity Board, Ipswich); and hon. publicity and press relations officer, Mr. H. H. Wright (A.E.I., Ipswich). Mr. H. V. Pugh, chairman of the Eastern Electricity Board, accepted the office of president of the Association for the coming year.

Mr. C. A. Ganderton

Mr. C. Cameron Kirby, manager of the Hull Sub-Area of the Yorkshire Electricity Board, has been appointed chairman of the Hull and East Riding Branch of the British Institute of Management for the coming session.

Mr. C. W. F. Longman, B.E.M., M.B.E.I., A.M.Inst.R., formerly domestic refrigeration engineer of Prestcold, has been appointed chief design engineer responsible for the Kenwood-Norge refrigerator range, part of the domestic electrical equipment produced by Kenwood Manufacturing (Woking), Ltd., and **Mr. F. P. Childerhouse,** formerly overseas contract manager of Prestcold, has been appointed sales manager of the refrigeration division, responsible for the Kenwood-Norge range.

Mr. F. H. Lomas, B.Sc., A.M.I.E.E., has joined Turners Asbestos Cement Co., Ltd., as technical sales engineer in the Electrical Insulation Department. For the last thirteen years he has been employed in electrical design and development work with the Metropolitan-Vickers Electrical Co., Ltd., now A.E.I. (Manchester), Ltd.

Mr. Allan Parker, A.M.I.E.E., A.M.I.Mech.E., M.Inst.F., station superintendent at Ince power station since 1954, has been appointed superintendent of the Padiham "B" station, N.W., Merseyside and North Wales Region of the C.E.G.B. He takes up his new post on 1st June.

Mr. A. Parker

Mr. Parker was with the former Burnley Corporation Electricity De-

Chief officers of the Southern Electricity Board's No. 4 (Bournemouth) Sub-Area (see article on page 998). ***Back row*** *(left to right): Messrs. H. T. Egan (district manager, Southampton), W. P. C. Orchard (district manager, Salisbury), H. F. Brewer (district manager, Bournemouth), P. Thornton Wood (district manager, Yeovil), F. A. Hitchcock (district manager, Weymouth), M. Clissold (district manager, Lyndhurst).* ***Front row:*** *Messrs. H. E. White (sub-area commercial officer), W. R. Parsons (sub-area engineer), T. Whitehouse (sub-area manager), H. Baldwin (sub-area secretary) and J. F. Reid (sub-area accountant)* partment from 1921 to 1929, and subsequently served with various Corporations, including Manchester. In 1945 he was appointed deputy superintendent at Blackburn power station and in 1948 transferred to Clarence Dock in a similar capacity where he remained until going to Ince power station in 1954.

Padiham "B" station is still in course of construction and will have an ultimate capacity of 240 MW. It is anticipated that the first turbo-alternator set will be commissioned in February next.

Mr. J. Conning

Mr. J. Conning, A.M.I.E.E., formerly production manager, Power Cables Division, of British Insulated Callender's Cables, Ltd., has been appointed works manager, Erith Works, responsible to the general manager, Power Cables Division. Mr. Conning joined British Insulated Cables, Ltd., in 1931 and was successively an estimating engineer on power cable systems, a high voltage cable research engineer, technical superintendent, power cables, Prescot, and power cables department manager, Erith Works. He became power cables divisional production manager in 1952, and was appointed production manager, Power Cables Division, in 1955.

Some 400 members and friends attended the **A.E.I. (Willesden) Long Service Association** reunion at Wembley Town Hall on 19th May. These reunions have been held annually since 1947 and this year the Association gained 26 new members. Membership of the Association is open to employees who have completed 25 years' continuous service; present membership is 328 and there are 110 hon. members. Mr. H. West, M.Sc., M.I.E.E., M.I.Mech.E., managing director, A.E.I. (Manchester), Ltd., the chief guest of the evening, was introduced by the Association chairman, Mr. P. E. Gaze.

Mr. J. Martin

Mr. J. Martin has been appointed to the board of Mather & Platt, Ltd., as head of the Pump Department. For the past ten years Mr. Martin has been managing director of Mather & Platt (S.A.) (Pty.), Ltd., Johannesburg. Previously he was on the staff of the London office of Mather & Platt, Ltd.

Mr. W. J. Heywood, chairman and managing director of S. H. Heywood & Co., Ltd., has taken over the direction of the Reddish crane works (owing to the death of his cousin, Mr. S. W. Heywood), in addition to the Manchester electrical contracting works. The directors have appointed **Mr. W. Howe** and **Mr. A. L. Hawes,** both of whom have been with the company for sixty years, to be general managers of the Manchester and Reddish Works respectively. Mr. Heywood has been a director of the company since 1934.

Mr. E. H. Jubb

Mr. E. H. Jubb, A.M.I.E.E., who, as we reported in our last issue, has been appointed district manager of the Gainsborough District of the Yorkshire Electricity Board in succession to Mr. H. Doust, who is retiring, has been senior assistant engineer (commercial) in the Grimsby Sub-Area since 1949. He has been in the industry for twenty-nine years, having served with the South East Yorkshire Light & Power Co., the Buckrose Light & Power Co., the London Passenger Transport Board, Kirkcudbright County Council, St. Austell & District Electric Light & Power Co., Ltd., and the South Western Electricity Board before going to Grimsby.

Mr. H. West, managing director, A.E.I. (Manchester), Ltd., accompanied by his wife at the A.E.I. (Willesden) Long Service Association reunion. The picture shows Miss K. Talbot, a member of the Association, presenting a bouquet to Mrs. West

The annual golf tournament of the **Midlands Branch of the Electrical Trades' Commercial Travellers' Association** was held on 19th May, at Drayton Manor Park, Tamworth. It was a Stableford Singles competition and the results were as follows:—Winner, Mr. S. C. Tutton; runner-up, Mr. A. D. Holmes. Other prize winners, Messrs. A. V. Aldous, G. A. Taylor and T. C. Beaumont.

Mr. E. Asha

Mr. E. Asha has been appointed as manager of the Manchester office of Santon, Ltd., in succession to the late Mr. T. Johnson, to whom he was deputy and a representative for some years.

As usual the annual dinner-dance of the **Incorporated Advertising Managers' Association** (held this year at the Dorchester Hotel, London, W., on 18th May) was a very pleasant affair. The toast of the guests was proposed by the president, Mr. Frank Edwards, and that of the ladies by the chairman of the Association, Mr. Ray Crew. Miss Charmian Innes wittily responded in an entertaining speech. Later, in an interval between dances, songs were charmingly sung by the Vernon Girls. Once again there was a large and varied collection of prizes, presented by members' firms. The proceeds of the tombola go to the National Advertising Benevolent Society. Mr. J. N. Gibson, who organised the event, can be congratulated upon a very successful evening.

OBITUARY

Mr. A. W. Dick, B.Sc., M.I.E.E., who had been in charge of the Order Section of the British Electric Transformer Co., Ltd., for the past twelve years, and who had been with the company for over thirty years, died on 19th May.

Mr. Rupert Browne, who resigned from the secretaryship of the Radio Industry Council early in 1957 owing to ill-health, died on 21st May. After a short period with the B.E.A.M.A., Mr. Browne joined the National Association of Radio Manufacturers in 1924, and when the Radio Manufacturers' Association was formed he joined that organisation. He became secretary of the R.I.C. when it was formed in 1945.

Mr. E. A. Joyce, head traveller for the General Electric Co., Ltd., from 1918 to 1938, died on 14th May at the age of eighty-two. He was a well-known figure among commercial travellers in the electrical trade. He was the first chairman of the Electrical Trades' Commercial Travellers' Association, and in all served forty-one years with the company. Mr. Joyce is survived by a widow, two sons, both in the employ of the G.E.C., and three daughters, two of whom were also employed by the G.E.C. before their marriages.

Mr. L. F. Jeffrey, B.Sc.(Eng.), M.I.C.E., M.I.Mech.E., M.I.E.E., who until 30th June, 1958, was divisional controller of the East Midlands Division, C.E.G.B., died at Nottingham on 5th May at the age of sixty-four.

M. Georges Claude, the French scientist whose discoveries included how to liquefy air and the use of neon lighting, has died in Paris at the age of eighty-nine.

Mr. E. W. Kilby, managing director of Omega Lampworks, Ltd., died recently at the age of seventy-nine. He had been a director of the company since 1928.

University Physics Department

On 17th May the new J. J. Thomson Physical Laboratory at Reading University was opened by Sir George Thomson, Master of Corpus Christi College, Cambridge, the son of Sir Joseph Thomson after whom the laboratory is named.

After the ceremony honorary degrees were conferred on Sir George Thomson, Professor N. F. Mott (Cavendish Professor of Experimental Physics, Cambridge), Dr. T. E. Allibone (director of the A.E.I. Research Laboratory, Aldermaston) and Professor F. Seitz, of Illinois University, U.S.A.

Electricity Supply Wages

The claim for a substantial wage increase for 120,000 manual workers in the electricity supply industry is to go to arbitration. This has been agreed by the National Joint Industrial Council for the industry. The employers' side had offered a review of the wages structure later this year, with a promise of a degree of backdating of any resulting increases, but this was rejected by the unions.

Parliamentary Report

Domestic Appliance Exports

Concern about the export drive in refrigerators and electric washing machines was expressed by Mr. Ginsburg in the House of Commons last week. The President of the Board of Trade, Mr. Maudling, agreed that the achievement in this sector had been disappointing recently, but said that the industry was well aware of the Board's feelings in this matter and was making vigorous efforts to try to improve its record.

Mr. Ginsburg said that not only had there been a consistent fall in the exports of these two manufactured products but also a systematic increase in imports. Did this not show a danger of prematurely liberalising our imports without ensuring that there was a sustained export drive ?

Mr. Maudling said it was perfectly true that there had been a big increase in imports of manufactured goods generally but it had been shown that a balanced liberalisation of trade and manufactured goods helped the country.

B.S.I. and Domestic Consumers

The British Standards Institution will receive a special grant of £10,000 for 1960-61 as a contribution towards the cost of its work for the domestic consumer, Mr. Maudling told the House. In so far as the remaining cost of that work was not covered by subscriptions from associates of the Consumers' Advisory Council, it would be met from the general resources of the Institution, to which the Government would contribute this year a grant of £160,000.

Subscriber Trunk Dialling

Asked about the progress being made with subscriber trunk dialling, the Postmaster General, Mr. Bevins, said that three centres now had S.T.D. and two more would have it in the next few weeks. He hoped they would achieve the target of 40 places by the end of 1960. The long-term programme had been speeded up so that 60 per cent of the users would have S.T.D. within five years and 90 per cent within ten years.

Office Working Conditions

The Offices Bill which enables the Home Secretary to make certain regulations in respect of offices, including the provision of "sufficient and suitable lighting in every part of the premises in which persons are working or passing" and "the regular inspection and maintenance of electrical equipment," was read a second time in the Lords.

Cable Colours

Agreement on a new European standard for coloured cables for domestic electrical appliances has been reached, Mr. Rodgers, Parliamentary Secretary to the Board of Trade, stated in a written reply to Mr. Skeffington. European countries were being invited to amend their regulations so as to conform to this standard by 1st July, 1961, he said.

European Refrigeration Association

The European Refrigeration Association has just completed a two-day series of meetings in London. The Association is representative of countries of both the Common Market and the European Free Trade Area and delegates from eight countries were present. Much information was pooled on commercial practices, statistics, professional training and technical standards with the possibility in mind of a greater exchange of all forms of refrigeration equipment taking place between the various European countries as the plans of the Common Market and the European Free Trade Area are realised. The meetings were organised by the British Refrigeration Association, which also arranged a reception at the Haberdashers' Hall.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £186 0s 0d
COPPER, H.C. Electro	ton £249 10s 0d
Fire Refined 99·70%	ton £248 0s 0d
Fire Refined 99·50%	ton £247 0s 0d
COPPER Tubes ..	lb 2s 4¾d
Sheet	ton £281 10s 0d
H.C. wire and strip	ton £301 15s 0d
LEAD, English ..	ton £78 5s 0d
Foreign	ton £77 0s 0d
MERCURY	flask £70 10s 0d
TIN, block (English) ..	ton £783 10s 0d
ZINC, G.O.B. Foreign	ton £91 10s 0d
BRASS Tubes (solid drawn)	lb 1s 11⅞d
Wire	lb 2s 9⅞d
PHOSPHORBRONZE Wire	lb 4s 2¾d
PLATINUM ..	oz £30 5s 0d
RUBBER, No. 1 R.S.S. spot	lb 38¾d—39¼d

Financial Section

STOCKS and SHARES

WHILE investment comment was concerned particularly with Mr. McFadzean's observations on the level of prices for mains cables, at the annual meeting of British Insulated Callender's Cables, attention was paid also to the chairman's emphasis on the breadth of the group's other activities, as a result of which the overall outcome of 1959 showed an improvement on the profits of the previous year and provided fully two-fold earnings cover for the maintenance of the dividend at 13½ per cent. Hopes of much early improvement in the least satisfactory sections of cable manufacturing received little encouragement, but it was noted that for the other activities the chairman foresaw a satisfactory year. The £1 shares have been on the dull side lately, at around 52s, and the yield of over 5 per cent compares favourably with the average for leading industrials.

Aberdare Holdings

At the recent annual meeting of Aberdare Holdings, Sir John Pascoe said it was fortunate that cable business accounted for only about one-third of the group's turnover, for the contribution from that section fell very substantially last year. Like the chairman of B.I.C.C., he could see little hope of improved, or even satisfactory, results in the current period. He too, however, was able to give a good account of progress in other sections of the group, and to report that profits as a whole had been rather better than maintained last year. Dividends totalling 17½ per cent have now been paid for six years running. No increase could be contemplated, said the chairman, while cable prices remained at the very low current levels. The latest payment is covered about 2½ times by earnings and gives a yield of over 5½ per cent on the 5s shares at a price of 15s 9d.

Firm Markets

Stock Exchange markets reacted firmly to the latest developments in the field of international politics. Price changes recorded during the week in the electrical share lists were mostly favourable, and some particularly good features were induced by individual company announcements. Among the latter, the Ever Ready and Decca dividend declarations were favourably received. In the case of the John Thompson annual results, the contraction of the net profit after tax by about one-third, and the 5 per cent cut in the dividend to 20 per cent, were no larger than had been apprehended since last year's interim statement and the shares were a little firmer at 18s 6d x.d. Like A.E.I., the company is setting up a substantial reserve against the contingency of losses arising from nuclear power contracts.

Decca Interim

The 10s shares of the Decca Record company rose well to 48s for the

Price Changes in

Company or Board	Nom. Value	Middle price 23rd May	Week's Rise or Fall	Dividend		Yield %			1960	
				Pre-vious	Last				High-est	Low-est
Gilt-edged Stocks						£	s	d		
Brit. Elec. 1968/73	100	76	−½	3	3	3	19	0	79½	75½
Brit. Elec. 1974/77	100	73		3	3	4	2	3	76	72½
Brit. Elec. 1976/79	100	75½		3½	3½	4	12	9	79½	75½
Brit. Elec. 1974/79	100	85½	−½	4¼	4¼	4	19	6	90½	85½
Brit. Elec. 1967/69	100	93		4½	4½	4	16	9	97½	92¼
Overseas Electric Supply										
Calcutta Elec.	£1	20/6		6·8†	7†	11	3	0	20/9	19/3
East African Power	£1	16/-		7½	8	10	0	0	20/3	16/-
Nigerian Elec.	£1	15/6		8	8	10	6	6	19/9	15/6
Perak Hydro-Elec.	£1	17/6		10	5	5	14	3	17/9	15/3
Electrical Shares										
Aberdare Holdings	5/-	15/9	−3d	17½	17½	5	11	0	19/-	15/3
Aerialite	1/-	7/9		54	54	6	19	3	9/6	7/6
Allen, W. H.	£1	51/3	−1/3	11	12	4	13	9	60/-	52/6
Allied Insulators	5/-	20/-		—	20	5	0	0	23/3	20/-
Anglo-Portuguese Tel.	£1	28/3		9	9	6	7	6	28/6	26/-
Aron Elec. Ord.	£1	62/-		15	15	4	16	9	62/-	47/-
Assoc. Elec. Ord.	£1	54/9	+3d	15	15	5	9	6	66/6	50/6
Automatic Tel. & El.	5/-	17/3x.d.		17	17	4	18	6	21/9	17/3
Babcock & Wilcox	£1	36/6	−2/3	13	9	4	18	9	48/9	33/6
Bakelite	10/-	51/-	+3/6	15	17½	3	8	9	51/3	40/-
Baldwin, H. J.	2/-	2/6		20	—		—		2/6	2/3
Berry's Electric	5/-	33/6		10	20‡*	2	19	9	38/-	29/6
Bowthorpe Holdings	2/-	8/-	−3d	27	18½*	4	12	6	11/6	8/-
British Elec. Traction:										
Def. Ord. "A"	5/-	42/-	−6d	25	35	4	3	3	49/3	42/-
B.I. Callender's	£1	52/-	−2/6	13½	13½	5	3	9	61/-	50/-
B.I. Callender's 6% Pref.	£1	20/-		6	6	6	0	0	21/-	19/9
British Thermostat	5/-	22/9	+1/6	35	20*	4	8	0	26/-	21/3
Brook Motors	10/-	45/-x.d.		25	25*	4	15	0*	53/6	45/6
Bulgin, A. F.	1/-	9/6	−6d	50	55	3	17	0*	10/3	8/-
Bulpitts	5/-	17/6		15	16¼	4	12	9	23/3	17/-
Burco Dean	5/-	13/3	−6d	16	18		—		15/9	12/6
Cable & Wireless	5/-	15/6	+3d	10	10*‡	3	4	6	18/3	14/3
Chloride El. Storage "A"	£1	71/3	+1/3	20	17½*	4	18	3	74/-	65/6
Clarke Chapman	£1	48/9		13¾	13¾	5	12	9	63/6	48/9
Cole, E. K.	5/-	22/6	−6d	17½	20	4	9	0	31/9	22/-
Contactor Switchgear	5/-	16/6		14	14	4	4	9	17/9	15/9
Cossor, A. C.	5/-	7/3		Nil	5	3	9	0	10/-	7/3
Crabtree	10/-	23/6		20	22½‡	4	15	9*	28/3	24/-
Crompton Parkinson	5/-	12/3		12	14	4	11	6*	15/-	11/9
Davis & Timmins	5/-	26/3	−1/3	20	25	4	15	3	28/9	21/-
De La Rue	10/-	64/-	−2/3	17½	20	3	2	6	73/6	62/-
Decca "A"	10/-	44/6x.d.	+2/9	50	20*	4	10	0	51/3	42/-
Desoutter	5/-	42/-		21⅜	30	3	11	6	42/-	37/6
Dewhurst	2/-	7/6		20	20	5	6	9	8/6	7/6
Dictograph Tel.	2/-	9/6	−3d	20	20	4	4	3	9/9	9/-
Dimplex	5/-	30/-		—	25‡	4	3	3	32/6	26/9
Dubilier Condenser	1/-	5/6		20	25	4	11	0	6/-	5/-
Duport	5/-	23/6	+1/6	12½	17½	3	14	6	30/3	22/-
E.M.I.	10/-	48/6	−1/6	20	14*‡	2	17	9	58/9	45/-
Electrical Apparatus	5/-	15/-	+3d	14½	14½	4	16	9	15/-	12/9
Electrical Components	5/-	9/6	−3d	12½	15	5	5	3*	13/9	10/-
Elec. Construction	£1	37/6		8½	9	4	16	0	43/-	35/3
Elliott-Automation	5/-	22/6	+6d	—	9·3*	2	1	0	25/-	19/9
Enfield Rolling Mills	£1	49/-	+1/-	15	15	6	2	6	56/3	48/-
English Electric	£1	39/3	−9d	14	10*	5	2	0	53/-	38/9
English Electric 3¾% Pref.	£1	12/6		3¾	3¾	6	0	0	13/-	12/6
Ericsson Tel.	5/-	22/6		13†	13†	4	14	3	28/6	22/6
Ever Ready	5/-	25/6x.d.	+2/-	27½	20*	3	18	6	27/3	23/-
Falk Stadelmann	£1	32/-		10	10	6	5	0	35/9	32/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

ordinary and 44s 6d for the "A" shares, following the announcement of a second interim dividend of 5d per share on account of the year ended last March. Together, the two interims for that period total 9d per share, compared with corresponding payments of 7d for last year, when there was a final of 1s 5d to make the equivalent of 20 per cent for the full twelve months. At the annual meeting held in January, with nearly ten months of the 1959–60 period already completed, the chairman had forecast considerably improved results. On the strength of the higher interim dividends the market is encouraged to look for a total of perhaps 25 per cent this year.

Ever Ready Results

Earnings of the Ever Ready Co. (Great Britain) continued firmly on the upgrade last year and provide shareholders with the sixth increase in the dividend within seven years. The latest advance in the net profit is of the order of 23 per cent, to a little over £1½ million after tax, and allowing for an intervening two-for-three scrip issue the improvement in the dividend is equal to 3½ per cent at a total of 20 per cent. The 5s shares reacted well to this news, rising 2s to 25s 6d x.d. They offer a yield of just under 4 per cent on a payment covered 2½ times.

Telephone Reports

Indications of a capital issue appear in the full report of Automatic Telephone & Electric. Bank overdrafts had reached nearly £2½ million by the end of last year and the directors have in mind a "rights" offer of new ordinary shares at an appropriate time. The chairman feels that the telecommunications industry is emerging from the difficult conditions of the past two years and expresses complete confidence in the company's future. The 5s shares were little affected by the prospect of an issue; at 17s 3d x.d. they yield nearly 5 per cent on the 17 per cent dividend. Telephone Manufacturing advised shareholders of poor trading conditions when the interim dividend was passed last year and now report a group loss after tax of £1,000 and the halving of the dividend to 5 per cent; the price of the 5s shares was marked down to 5s 9d.

Company News

British Thermostat gave a warning half way through their last financial year that earnings were running at a reduced level, and now report a contraction of about 10 per cent in the net profit to £397,000, after tax. Nevertheless the distribution is being raised, for the third year in succession, and the new rate of 20 per cent still leaves two-thirds of the distributable surplus to go back into reserves. At 22s 9d the 5s shares are now on a yield basis of approximately 4½ per cent. There is similarly substantial cover for the Newman Industries latest dividend, which has been raised from 10 to 12½ per cent and is paid from a net surplus more than double the previous year's. At the annual meeting the chairman reported that both sales and profits in the current year were showing a satisfactory increase.

Electrical Investments

Company or Board	Nom. Value	Middle price 23rd May	Week's Rise or Fall	Dividend		Yield %			1960	
				Pre-vious	Last				High-est	Low-est
Electrical Shares—continued						£	s	d		
G.E.C.	£1	38/-	−1/-	10	10	5	5	3	47/6	37/-
G.E.C. 6½% Pref.	£1	21/-		6½	6½	6	3	9	22/3	21/6
General Cables	5/-	6/-		15	Nil	—			10/-	6/-
Goblin (B.V.C.)	5/-	9/9		7½	12½	6	8	3	13/9	9/9
Hackbridge Holdings	5/-	15/9	+6d	20	20	6	7	0	17/3	15/-
Hackbridge & Hewittic	5/-	14/3		20	20	5	5	3*	15/-	13/-
Head Wrightson	5/-	21/3		20	14*	3	5	9	31/6	21/3
Heatrae	2/-	11/6		20	20	3	9	6	11/9	8/9
Holophane	5/-	18/-		22½	26	7	4	6	20/6	17/6
Hoover	5/-	50/-		60	90	4	10	0*	55/-	45/-
I.C.I.	£1	58/6		8	11¼	3	17	0	62/9	55/6
Intl. Combustion	5/-	28/3	−3d	30	30	5	6	3	46/9	26/6
Intl. Computers & T.	£1	66/3	+1/9	—	10	3	0	3	78/6	61/6
Johnson & Phillips	£1	21/-		5	5	4	15	3	24/-	20/-
Laurence Scott	5/-	19/6	+1/-	15	15*	3	17	0	25/3	18/-
Lister, R. A.	£1	52/6		12½	14	5	6	9	62/-	52/6
Lucas, J.	£1	65/-	−9d	10	12½	3	17	0	74/6	65/9
Marryat & Scott	2/-	15/-		37½	22½*	2	19	0	16/9	14/3
Mather & Platt	£1	47/6	−1/3	10⅜	11	4	12	6	59/-	47/6
Metal Industries	£1	62/6		14	15‡	4	16	0	76/3	61/3
Midland Elec. Mfg.	£1	58/9		10	12	4	2	0	58/9	53/6
Morphy-Richards	4/-	20/6	−9d	20	25	2	8	9*	22/-	16/3
Murex	£1	67/6	+2/6	17½	15	4	9	0	77/-	62/6
Newman Ind.	2/-	5/3		10	12½	4	15	3	5/3	4/-
Oldham & Son	1/-	3/3		17½	17½	5	7	9	3/3	2/9
Parsons, C. A.	£1	51/-	+1/9	8⅛	9⅜	3	13	9	59/-	46/-
Philips' Lamps	Fl.10	187/6	+7/6	13·3	16	1	14	3	187/6	137/-
Plessey	10/-	50/-	+2/-	20	14*‡	2	16	0	54/6	44/3
Pye	5/-	16/6	−3d	12½	12½*‡	3	15	9	19/-	16/-
Pyrotenax	5/-	55/-		—	34	3	2	0	55/-	44/3
Radiation	£1	38/9		6	12	6	3	9	44/6	34/6
Reliance Clifton	5/-	22/-		15	15	3	8	3	28/-	22/-
Reyrolle	£1	38/-x.c.	−9d	17½	17½	4	12	0*	52/3	38/-
Rheostatic	4/-	21/-		20	25‡	4	15	3	22/-	16/6
Richardsons Westgarth	10/-	11/-		8⅓	8⅓	7	11	6	14/9	10/9
Sangamo Weston	10/-	20/-		12½	11*	5	10	0	22/9	19/3
Simon-Carves	5/-	50/-	+1/3	25	35	3	10	0	54/-	36/-
Smith (England), S.	4/-	16/3		12½	17½	4	6	3	20/-	16/-
Southern Areas	£1	14/6x.d.	−3d	Nil	5	6	18	0	15/6	13/-
Strand Elec.	5/-	16/-		15	20	6	5	0	20/3	16/-
Sturtevant	5/-	15/-		15†	15†	8	3	3	24/3	15/-
Sun Elec.	5/-	15/3		25	15*	4	18	3	16/3	15/-
Switchgear & Cowans	5/-	16/-		15	17½	5	9	6	18/9	16/-
T.C.C.	10/-	46/3x.c.	−2/-	25	35	5	1	0*	48/3	37/3
Telephone Mfg.	5/-	5/9x.d.	−3d	10	5	4	7	0	7/3	5/-
Telephone Rentals	5/-	20/-		12½	15*	3	15	0	19/9	17/-
Thompson (John)	5/-	18/6x.d.	+9d	25	20	5	8	0	25/9	17/3
Thorn Elec.	5/-	47/6		17½	20	2	2	0	55/6	44/3
Thorneycroft	£1	23/9	+9d	7½	6	5	1	0	31/-	23/-
Tube Investments...	£1	78/9	+1/3	20	13‡	3	6	0	95/6	65/3
Vactric	5/-	32/6	−6d	25	37½	5	15	6	43/9	32/-
Walsall Conduits	4/-	13/9		22½	22½	3	14	3*	16/-	13/9
Ward & Goldstone	5/-	54/6	+2/6	25	30	2	15	0	59/3	51/3
Watford	2/-	11/6		25	25	4	7	0	17/6	11/-
Westinghouse	£1	49/-		10	11	4	9	9	59/9	49/-
West, Allen	5/-	12/9x.d.	+3d	12½	12½*	4	18	0	17/-	14/-
Wilkins & Mitchell	5/-	20/-		15	17*	4	5	0	25/9	19/9
Wolf Electric	5/-	12/3	+3d	10	12½	5	2	0	13/3	10/9

REPORTS and DIVIDENDS

British Insulated Callender's Cables, Ltd.—The accounts for 1959 were reviewed in our issue of 22nd April. In his statement, which has since been circulated, Mr. W. H. McFadzean (chairman) says that the group sales totalled £128 million, as compared with £110 million for 1958, and reflected not only the addition of new subsidiaries, but a higher level of activity. Of this total £38 million, or some 30 per cent, represented exports from the United Kingdom and sales of overseas companies.

The year 1959 proved to be a landmark in the cable-making industry involving a major re-orientation of trading arrangements for the home market, particularly in the field of low-voltage mains cables and wiring and general cables. The new trading conditions resulting from the Restrictive Trade Practices Act have coincided with an excess capacity brought about to some extent by technological changes, such as the change-over from rubber to thermoplastic insulation and by some shrinkage in export business, mainly due to the setting up of local factories in many parts of the world. The immediate effect was unfettered competition, with prices falling to levels which left little or no margin to an efficient producer. The B.I.C.C. has given a lead to the industry by raising prices to some extent, although these have by no means brought them back to overall economic levels. A valuable contribution to solving present difficulties has been, and is being, made by themselves and others by way of rationalising production. Mr. McFadzean considers that the overall results for 1959 emphasise the underlying strength of the group.

The group's position has been strengthened by the addition of Telcon and Scottish Cables and by the acquisition of minority shareholdings in other group companies. On the production side, arrangements have been made for the Metropolitan Electric Cable & Construction Co. and the St. Helens Cable & Rubber Co. to cease manufacture and for their output to be concentrated in other units of the group. This is being followed by a change from multilateral to unilateral selling, which will not only reduce costs by avoiding duplication of selling effort, but will also enable the group to provide an even better coverage for customers. Referring to the continuing swing towards the use of plastic materials in cable manufacture, the chairman says that the group is well in the forefront with special designs, and high-speed extrusion and associated devices have been developed together with novel jointing techniques. The depressed prices in low-voltage mains and wiring and general cables have been offset to some extent in B.I.C.C. by increases in demand and in efficiency.

A notable feature has been the increase in demand for aluminium sheathed power cable; their development of the use of corrugated seamless aluminium sheaths both for oil-filled and solid type super-tension cables has aroused considerable interest. The cross-bonding technique pioneered in this country by W. T. Glover & Co. has now been accepted by the C.E.G.B. on schemes employing large sizes of conductor. The contract for 125,000 yd of 132 kV gas-filled cable between Belvedere and Sydenham employing this technique was completed during the year.

There has been an improvement welcome to B.I.C.C. and Connollys (Blackley)—the two members of the home group most interested in telephone cable business—in the volume of orders received from the Post Office. They have also been successful in obtaining valuable export business despite intense competition, an outstanding example being an order from Venezuela valued at £1,365,000. In the home market, contracts were secured for further work associated with the electrification and modernisation of British Railways. Submarine Cables, Ltd. (in which they have a 50 per cent interest), received an order for the new cable between the United Kingdom and Canada, the total value of which is approximately £4 million.

The mineral insulated cables division continues to expand. Trading conditions in winding wires were difficult in the earlier months of 1959, but considerable improvement followed and the buoyant market continues. There has been a welcome increase in the demand for heating cables for the "Panelec" heating systems. The submarine cable section at Trafford Park was lightly loaded in 1959 and the year was essentially one of further technical developments in existing and new products. Many interesting schemes are under consideration and there are encouraging signs of substantial orders being placed. British Copper Refiners had an output of some 80,000 tons and the wire mill division also had a busy year with an output of some 90,000 tons of copper and aluminium. After dealing briefly with some of the other products of the group, Mr. McFadzean says that construction activities continued to expand both at home and overseas and profits for 1959 showed a satisfactory increase. He also refers to the progress of the overseas companies. The modernisation of the Wood Lane research laboratories is proceeding and the new block will be completed next autumn.

In assessing the outlook, the chairman says that there will be plenty of business available during 1960. The main problem will be prices, particularly those of low-voltage mains and wiring and general cables. A large proportion of their mains cables is sold under annual contracts and it will be some months yet before the new prices apply. The most important factor here is whether the self-discipline which several companies have imposed will be sustained. If it is, then 1960, whilst not producing satisfactory results in this range of products, may witness the re-introduction of stability into the cable-making industry.

John Thompson, Ltd.—The group profit for 1959 amounted to £1,331,642, as compared with £1,742,336 for the preceding year, and after providing £457,495 for taxation, the net balance is £324,311 (against £501,055). It is proposed to pay a final dividend of 12½ per cent, making 20 per cent for the year (against 25 per cent). The 1959 results include the trading results of subsidiary companies, the share capital of which was acquired in September, 1958, for the period 9th September, 1958, to 31st December, 1959.

In announcing the results, the directors refer to the Berkeley nuclear power station contract, and state that the principal contracting company of the group has followed its customary procedure of charging against trading the relative overhead expenses and of valuing work in progress at direct cost plus a percentage thereon. Following the customary procedure, certain manufacturing companies have taken credit for realised profits on completed work undertaken for this contract, and such profits are included in the general trading profit. It is anticipated that ultimately there may be an overall loss on this contract. It is not possible at present to assess what this may be, as regards work undertaken by the companies in the group, or as regards their share of any loss which may be incurred by the A.E.I.-John Thompson Nuclear Energy Co. Pending completion, a sum of £500,000

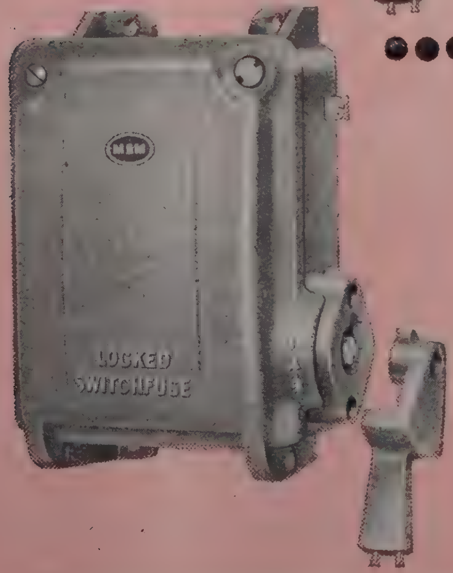
[Continued on page 1037

MEM SWITCHGEAR for Neon Signs

M.E.M. Switchgear for Neon Lighting Installations complies with I.E.E. Reg. 713, for Fireman's Emergency Switches, and I.E.E. Reg. 712, for Locked Switches. The Switches are of Double Pole, quick make and break type, and are designed to break inductive loads to full rated capacity, in accordance with I.E.E. Reg. 702. Cases and covers are of cast iron, tapped one $\frac{3}{4}''$ conduit top and bottom. A Gasket between case and cover makes the unit fully weatherproof.

215 AF
15 AMPS
250 VOLTS
Q.M. & B.

215 AS
15 AMPS
250 VOLTS
Q.M. & B.



215 KS
15 AMPS
250 VOLTS
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FIREMAN'S EMERGENCY SWITCH

Has "OFF" position at the top and is provided with a spring loaded locking device which prevents accidental return of the switch from the "OFF" to the "ON" position.

Switch handle is designed for pole operation.

Finished in red stove enamel.

LOCKED ISOLATING SWITCH AND SWITCHFUSE

Prevents restoration of supply by unauthorised persons.

Operating handles can only be removed when switch is in "OFF" position. The removable handle serves as a special key for unlocking the cover.

Switchfuses are available in Single Pole and Neutral and Double Pole patterns.

Write for List No. 428 on M.E.M. Neon Switchgear.

MIDLAND ELECTRIC MANUFACTURING CO. LTD.
REDDINGS LANE, TYSELEY,
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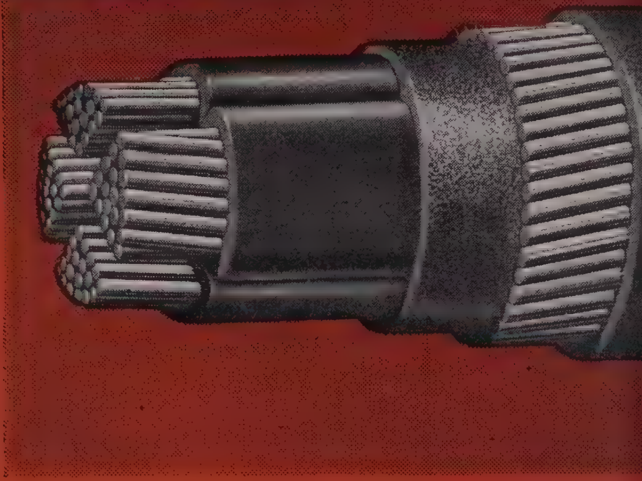
60 YEARS OF PROGRESS...

P.V.C. INSULATED POWER CABLES

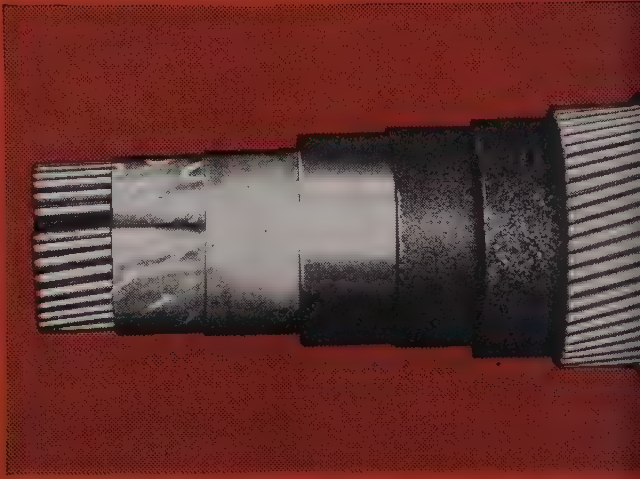


Available for the same conductor range as
for Paper Insulated Cables, to B.S. 480/1954,
for voltages up to and including 3.3 Kv.

Send for publication No. B16

CONNOLLYS

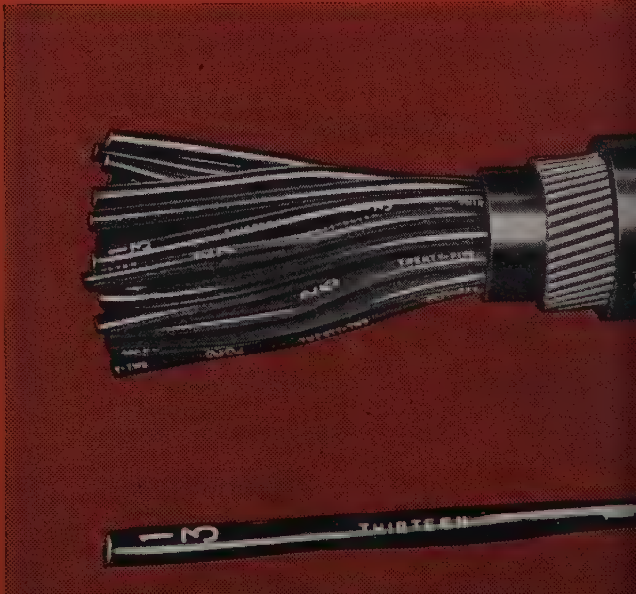
PAPER INSULATED POWER CABLES



Standard range covers 1,100 volts to
11,000 volts with full range of armouring and
overall protection with bituminous textiles or P.V.C.

Further details on request.

PILOT AND CONTROL CABLES



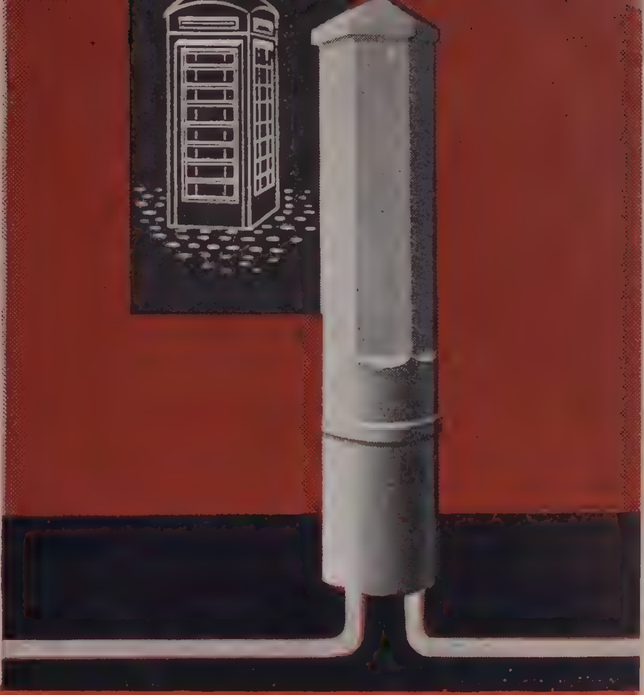
A range of power and control cables is available
at voltages up to 1,100. To facilitate identification,
the P.V.C. insulated cores are clearly printed at
frequent intervals with the appropriate legend and
numerals. The laid up cores are sheathed with P.V.C.
[illegible] can be armoured and P.V.C. protected if required.

Further details on request.

TELECOMMUNICATION CABLES

Connollys plastic insulated and sheathed cables are servicing telephone administrations throughout the world. Cables can be armoured with protected galvanised steel if there is a danger of mechanical damage, or they can be supplied with inbuilt catenary for overhead suspension. All cables are suitable for installation in tropical conditions.

Send for publication B.11A (Polythene Insulated)
and publication B.14A (P.V.C. Insulated)



FOR CABLES

WIRING SYSTEM CABLES

Connollys stock a wide range of plastic insulated and sheathed cables in accordance with B.S. 1557/1954 (Polythene insulated, P.V.C. sheathed) and B.S. 2004/1955 (P.V.C. insulated, P.V.C. sheathed).

Further details on request.

'BLACKLEY' INSULATING TAPE

'Blackley' Tape has been produced by Connollys since 1895 and its adhesive and insulating properties are appreciated throughout industry. The adhesive surfaces never 'strip' because the rubber compound is frictioned on to both sides of specially woven cloth. Available in widths ½" to 2" in 5, 10, 25 and 50 yard rolls.

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BICC GROUP

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BIRMINGHAM: 39-44 Watery Lane, Bordesley 9
Tel: Victoria 4991-2. Telex: 33-309
GLASGOW: 73 Robertson St. C.2. Tel: Central [illegible]
NEWCASTLE-UPON-TYNE, 1: 6 Baltic Chambers, [illegible]
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CONNOLLYS (BLACKLEY) LIMITED

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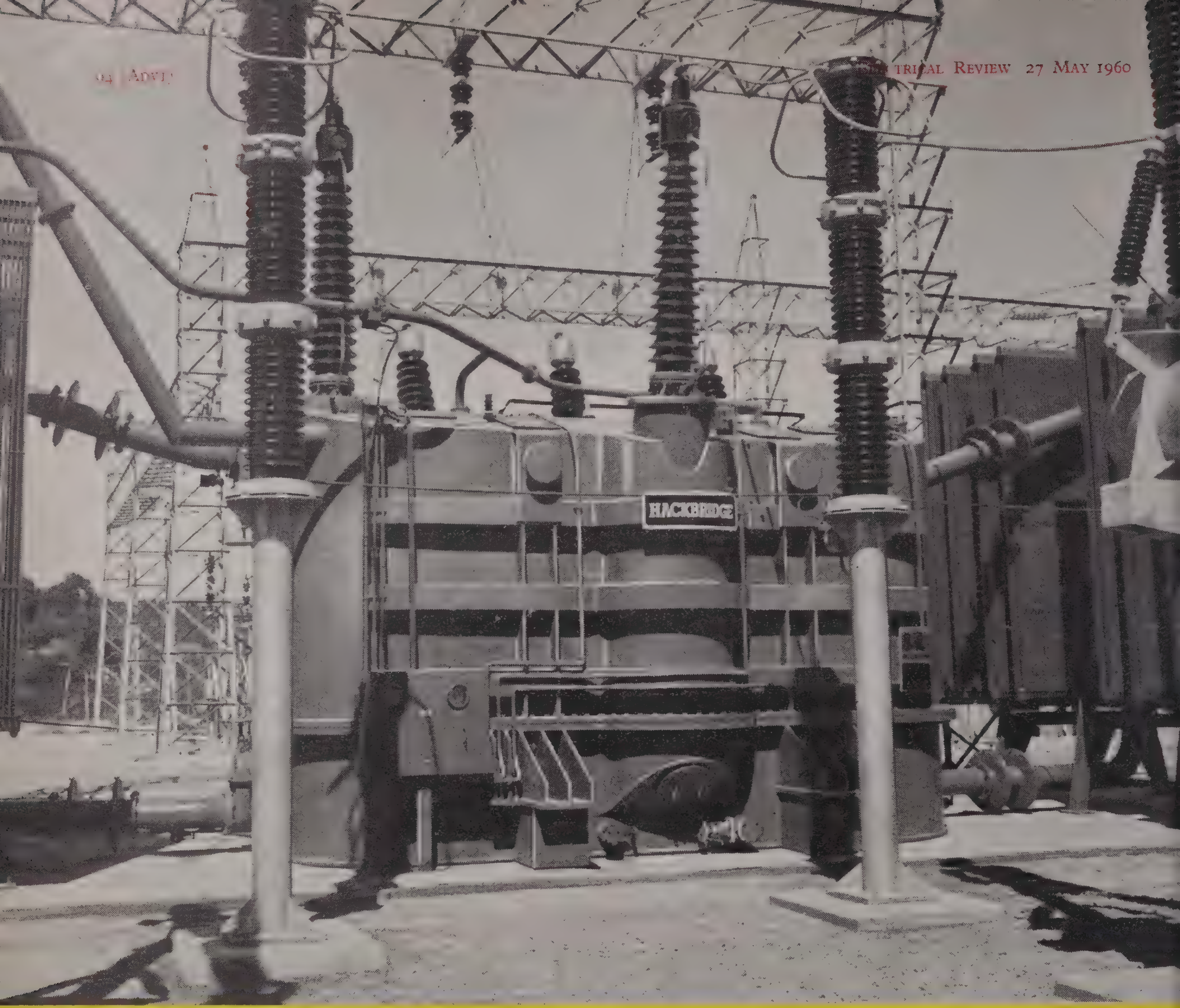
CL.54



One of three 100 MVA 220/110 KV
Hackbridge transformers installed
at the Chapel Street substation, Hobart,
Tasmania Hydro Electric Commission

TRANSFORMERS
BY
HACKBRIDGE

HACKBRIDGE AND HEWITTIC ELECTRIC CO., LIMITED
WALTON-ON-THAMES - SURREY - ENGLAND
Telephone: Walton-on-Thames 28833 (8 lines) Telegrams & Cables: "Electric, Walton-on-Thames"

FINANCIAL SECTION *(continued)*

has been set aside by way of transfer in the consolidated appropriation account from the general reserve to a special nuclear contracts reserve. An associated company in which John Thompson has a one-third interest, has incurred ascertained losses up to 31st December, 1959. No provision has been made in the accounts in respect of £152,778 (being the one-third proportion of those losses).

Automatic Telephone & Electric Co., Ltd.—The principal figures in the accounts for 1959 were given in our issue of 13th May. In his statement, which has been circulated with the report and accounts, Sir Thomas Eades (chairman) says that, due to the reduction in the value of contracts received from the Post Office and the problems of rising costs and intense competition in world markets, both the turnover and the financial performance of the parent company were not as good as in 1958. However, subsidiary companies showed increased turnover and profitability as compared with 1958 and group figures *in toto* showed little change.

Research and development, with its associated activity, education and training, must continue to be the foundation of the progressive prosperity of the company. Last year he referred to the development of both electro-mechanical and electronic equipment to provide subscriber trunk dialling in London and other principal cities in Great Britain. The Post Office has decided to order the electronic type; this is a substantial step forward in the application of electronics to their principal business. A fully electronic exchange designed and made in conjunction with the Post Office and the four other principal telephone equipment manufacturers, was demonstrated by the Postmaster General in November last year, but it may still be some years before the electronic exchange is ready to establish itself in all parts of the world in competition with the existing electro-mechanical systems. In consequence, they have thought it necessary to be ready to supply an alternative electro-mechanical system in those parts of the world where the technical complexity of electronics may hinder or postpone its adoption. For many years they have devoted part of their research and development to crossbar systems, and they have therefore decided to market a range of these.

An increasing proportion of effort is devoted to developing new products. The application of communications type equipment in many other fields—data processing, instrumentation, road and air traffic control—is increasing year by year, providing markets which are expanding at a considerably greater rate than the telephone business. After briefly reviewing the activities of the subsidiary and associated companies, Sir Thomas says that so far as the future is concerned, the telecommunications industry is now emerging from the somewhat difficult trading conditions that have persisted over the past two years. A full order book on the home front will go a long way to help them in their efforts in the export field. Although the A.T.E. group is primarily concerned with the manufacture and sale of telecommunications and ancillary equipment, its associated and other activities continue to grow steadily and satisfactorily.

Mavor & Coulson, Ltd.—The annual meeting was held on 19th May. In their report covering 1959, the directors stated that the sudden and drastic cutting down of orders by the National Coal Board resulted in a considerable drop in turnover and profits. The drop in profits would have been even greater had not more overseas business been obtained; sales to overseas customers were the highest for many years. The orders booked by the group in 1959 were lower in value than in the previous year. It was still impossible to forecast when the ordering of underground machinery on a substantial scale would be resumed by the Coal Board. It was unlikely that in the near future the value of orders would approach the high level of those placed in 1956 and 1957, and there would be keen competition. With the facilities now available, however, the group as a whole should obtain orders for a substantial share of the Coal Board's requirements, and also an increasing share of orders for mechanical handling and electrical equipment for other industries at home and abroad.

Head Wrightson & Co., Ltd., report a group trading surplus of £1,648,515 for the year to 31st January last, as compared with £1,815,173 for the preceding year, and a net profit of £803,758 (against £874,654). It is proposed to pay a final dividend of 10 per cent, making 14 per cent for the year (against an equivalent of 13⅓ per cent after allowing for a scrip issue).

Simms Motor & Electronics Corporation, Ltd.—The group profit for 1959 amounted to £1,037,690, as compared with £632,072 for 1958, and after providing £548,200 for taxation, the net balance is £489,490 (against £266,072). General reserve receives £100,000 and it is proposed to pay a final dividend of 10 per cent, effectively increasing the total for the year by 2½ per cent to 15 per cent. The previous year's dividend total of 12½ per cent included a special interim dividend of 6½ per cent in lieu of a final dividend.

The Telephone Manufacturing Co., Ltd., reports that after a taxation charge of £57,427, there is a group loss for 1959 of £1,059, as compared with a profit of £67,316 for the preceding year. The loss attributable to members of the holding company is £20,444 (against a profit of £61,890). It is proposed to pay a dividend for the year of 5 per cent (against 10 per cent).

The British Electric Transformer Co., Ltd., announces that the offer by C.P. Properties, Ltd., to purchase all its issued 5 per cent cumulative preference shares of £1 each has now been accepted by the holders of more than 90 per cent in value of the total shares issued and the offer is therefore unconditional.

Relay Exchanges, Ltd.—Philip Hill, Higginson, Erlangers, Ltd., announce that arrangements have been completed for the placing at 98½ per cent of £1,500,000 6¼ per cent unsecured loan stock 1979/84 second series.

Associated Electrical Industries, Ltd., has declared an interim dividend of 2½ per cent (unchanged).

Liquidations

Hare & Hooker, Ltd., electrical and heating engineers, 334, Eden Park Avenue, Beckenham, Kent.—Winding up voluntarily. Liquidator, Mr. D. Knoll, 35, Dover Street, London, W.1, appointed 28th April. Particulars of claims to the liquidator by 15th June. This notice is purely formal. All known creditors have been, or will be, paid in full.

D.I.D., Ltd., electrical goods dealers, 93, Westgate End, Wakefield.—Winding up voluntarily. Liquidator, Mr. R. W. Hellyer, Brotherton Chambers, Westgate, Leeds, 1, appointed 12th May. Particulars of claims to the liquidator by 12th June.

Bankruptcies

J. J. Franey and **E. L. Bailey,** carrying on business in co-partnership at 77, Barnsley Road, South Elmsall, Yorks., under the style of Regent Electrical Co., electrical dealers.—Trustee, Mr. P. Cardwell, 93, Queen Street, Sheffield, appointed 3rd May.

D. R. Kemp, formerly carrying on business at 15, Farnsworth Avenue, Ashton-under-Lyne, and at North Mill, Katherine Street, Ashton-under-Lyne, under the style of Batty and Jackson, electrical contractors.—Last day for receiving proofs for dividend 31st May. Trustee, Mr. J. Tye, 20, Byrom Street, Manchester, 3.

C. S. Smith, lately carrying on business at 9, Pedder Street, Morecambe and Heysham, Lancs., electrical engineer and contractor.—Last day for receiving proofs for dividend 31st May. Trustee, Mr. J. A. Freeman, 8, Manchester Road, Bury, Lancs.

INDUSTRIAL NEWS

Power Station for Mexico

In the face of severe American and Continental competition, Associated Electrical Industries Export, Ltd., has been awarded the first contract placed by the Comision Federal de Electricidad, Mexico, as part of its new five-year plan. The order, valued at nearly £3¼ million, is for the complete plant for a new power station to be built at Ciudad Juarez. The generating equipment will comprise three 33 MW turbo-generator sets, with condensing, feed heating and deaerating plant; also instrumentation and controls, boiler feed pumps, motors and water treatment plant. Other equipment includes switchgear, transformers, control and relay panels, main and multi-core cables, battery and charging equipment, and all the station lighting, power points and earthing equipment, as well as cooling towers, circulating-water piping and valves, motors and overhead travelling cranes.

The contract covers designs for the buildings and civil engineering works, and the oil-fired boiler plant will be supplied by Babcock & Wilcox, acting as sub-contractors to A.E.I. The first of the generating sets will be completed in 1961, and the whole of the equipment will be delivered within 3½ years from the date of the order.

The steam turbines will be of single-cylinder construction designed for operation at 3,600 r.p.m. with steam conditions of 900 p.s.i.g. 900°F at the turbine stop valve, and exhausting to the condensers at a vacuum of 28·25in Hg at the economical continuous rating of 24 MW with cooling water at 80°F. Five-stage feeding systems will be supplied. The generators will be hydrogen cooled and 60 c/s 3-phase a.c. will be produced at 13·8 kV 0·8 power factor.

This is the third order for complete power station equipment obtained recently from Mexico by Associated Electrical Industries Export, Ltd.

Contract Price Formulæ

The British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 13th May is deemed to be 204s 6d. The "costs of materials" figures are: For electrical machinery and equipment the Board of Trade index figures published on 13th May are 181·3 (1949=100) and 116·9 (1954=100); both figures are provisional. For turbo-generating and allied plant: Materials used in mechanical engineering industries 189·5 (1949=100) and 126·1 (1954=100); both figures are provisional. Blast furnaces and iron and steel melting and rolling (40 and 41) 188·2 (1949=100) and other steel goods, excluding tubes (311 and 312), 128·2 (1954=100); both figures are provisional. The price of ¾in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 13th May) is 49½d/lb.

B.I.C.C. Selling Scheme

Changes in the structure of the electric cable making industry have caused the B.I.C.C. Group to reorganise both its cable production facilities and its marketing arrangements. It has been reported already that the factories of the Metropolitan Electric Cable & Construction Co., Ltd., and the St. Helens Cable & Rubber Co., Ltd., will cease cable production in the near future, and that their output will be concentrated at other factories within the Group.

In order to augment its service to customers throughout the country, B.I.C.C. announces that from 1st June the home sales forces of Glovers, St. Helens, Metropolitan, Scottish, and Telcon, concerned with the sale of cables insulated with rubber or thermoplastics, will combine with the B.I.C.C. home sales organisation and will sell a standard product presented on a standard drum or reel identified by the B.I.C.C. Group trademark. Additional B.I.C.C. depots are being established in Bradford, Dudley and Portsmouth. All operations after 1st June will be based on B.I.C.C. branch offices.

Fusion Research Apparatus

The working model of an apparatus used for controlled fusion research at the Atomic Weapons Research Establishment, Aldermaston—"Minnie"—has been presented to the Royal College of Science and Technology, Glasgow, where it will be employed in low-energy experiments with plasmas. The device is essentially a low-inductance bank of 200 condensers firing through the same number of spark gaps in parallel to give an extremely fast build-up of current in discharges through deuterium gas contained in a straight quartz tube. It has a maximum voltage of 5 kV, a maximum stored energy of 2,000 joules and an inductance of 2·2 millimicrohenrys. "Minnie" is a low voltage model of the condenser bank "Maggie I" (30 kV, 45,000 joules, 5 millimicrohenrys) which is in use at A.W.R.E. for thermonuclear research.

Volume of Exports and Imports

The high rate of expansion in the volume of United Kingdom trade in the last quarter of 1959 continued during the first three months of this year. The Board of Trade index for the volume of electrical exports in the first quarter of 1960 was 127, compared with 121 a year earlier and 126 in the last quarter of 1959. The corresponding indices for electrical imports were 229, 185 and 219.

Refrigerator Sales in March

Sales on the home market of British-made domestic refrigerators totalled 103,306 in March, as compared with 40,740 in March, 1959. This is an increase of 153 per cent, and more than maintains the upward trend of last year and the first two months of 1960. There was also an increase of 44 per cent on export sales. In announcing these figures, the Domestic Refrigeration Development Committee points out, however, that owing to a change in the industry's method of calculating statistics, the home market sales for March may give a somewhat too favourable an impression for that month and for April.

Chelsea Flower Show

The Electrical Development Association's exhibit at the Chelsea Flower Show, which has been held this week, again stressed the value of electrical methods for growing crops. The theme of the exhibit was automatic operation, labour saving, reduction of overheads and convenience. Introductions this year were the "Activair" method of space heating by a 20 kW fan heater; greenhouse heating by mains voltage mineral insulated heating cables; low volume spraying of insecticides and fungicides; a cycling thermostat and automatic watering, both for the amateur and for the commercial grower. The grower's house showed mist propagating and automatic watering, pot chrysanthemums grown by the all the year round method, space heating boosting by fan heaters, space heating and air movement through polythene tubes, pest control by aerosols, bench warming by low and main voltage wires and cables, supplementary lighting for cucumbers and tomatoes and the provision of several climates in one house with enclosed warmed benches.

T.U.C. and E.T.U.

Last week the Electrical Trades Union Executive Council replied to the "ultimatum" presented to it by the General Council of the Trades Union Congress. The T.U.C. called upon the Union to take legal action against those who had accused it of malpractices in the conduct of its elections of officers or alternatively to submit to a judicial inquiry into the matter. It is believed that the E.T.U. Executive Council reiterated its desire that if there were any inquiry it should be by a prominent trade unionist. In any event since writs have been issued against the Executive Council by two E.T.U. members the matter is regarded as being *sub judice*.

Upon considering the matter last Monday, the T.U.C. Finance and General Purposes Committee recommended that further action should be suspended for the time being.

Research Essay Competition

The Scientific Advisory Board of *Research* is continuing this year its Waverley Gold Medal Essay Competition in which a gold medal and £100 is awarded to the best 3,000-word essay describing a new scientific project or practical development potentially applicable in industry. There are two other prizes of £50. The Board is also introducing a new "Application in Industry" essay competition, with prizes of £50 and £30, which is intended to draw attention to the practical problems encountered when applying scientific developments to industrial projects. Particulars of the competitions, entries for which must be sent in by 31st July, can be obtained from the Editor of *Research*, 4-5, Bell Yard, W.C.2.

Patents and Trade Marks World Congress

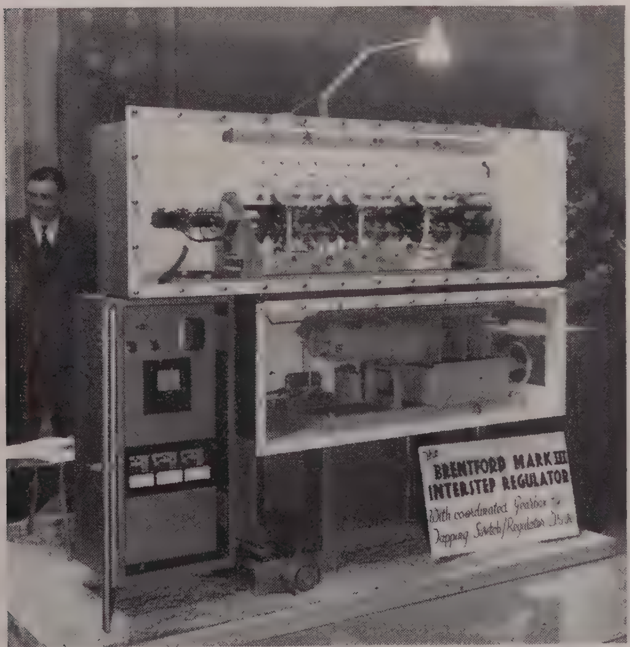
The 24th Congress of the International Association for the Protection of Industrial Property, which covers patents, trade marks, and industrial designs, will be held in London from 30th May to 4th June, under the patronage of the Duke of Edinburgh; 1,300 members from forty countries will be attending.

Mechanical Handling Review

The June issue of *Mechanical Handling*, the Iliffe journal which organised this month's Mechanical Handling Exhibition, will contain a fully illustrated review of the exhibition. It will include details of all exhibits, classified under their various sections, and reports of the exhibition functions. This special issue, to be published on 9th June, at the usual price of 3s 6d, will also contain the usual wide range of articles on time-, cost- and labour-saving equipment.

Iron and Steel Films

Two new colour films were recently shown by the United Steel Companies. The first, entitled "Out of the Forest," described the production of metallurgical coke which is used in the manufacture of iron by the Appleby-Frodingham Steel Co., of Scunthorpe. The carbonisation of coal also gives rise to a whole range of useful chemical derivatives. How they are derived and the applications for them are also described in the film by an industrial chemist. The film has a running time of 30 minutes and is available in 16 and 35 mm. The second film, entitled "Stone to Steel," is without a spoken commentary but relies for its impact on the effect of many contrasting and dramatic film sequences supported by a specially composed musical score. It shows the production of steel from ironstone through the blast furnaces to the rolling mills and the final sequences show some of the applications of steel in shipbuilding, civil and general engineering industries. This film runs for 37 minutes and is also available in 16 and 35 mm. Both these films may be borrowed on application to the Public Relations Officer, United Steel Companies, Ltd., The Mount, Broomhill, Sheffield, 10.



The Brentford Transformers Mark III interstep regulating unit which was shown at an exhibition in London on 3rd May. A description of the unit appeared on page 986 of our last issue

Steel Mill Equipment Order

The Head Wrightson Machine Co., Ltd., a subsidiary of Head Wrightson & Co., Ltd., has received an order from Maschinenfabrik Sack, G.m.b.H., of Dusseldorf, for the provision of equipment for a complete billet mill. The value of the contract is approximately £700,000 and includes the intermediate roller tables, cooling banks, and mill drives. The equipment is to be installed at the Redbourn Works of Richard Thomas & Baldwins, Ltd., from whom Sack have received a contract for the supply of the complete mill.

Diesel Locomotives for British Railways

Orders for a further 190 main-line diesel locomotives, valued at £15½ million, have been awarded to the English Electric Co., Ltd., and form part of the programme of modernisation of British Railways. The orders cover three types of diesel-electric locomotives—type 1, 1,000 h.p. (78), type 3, 1,750 h.p. (37), and type 4, 2,000 h.p. (75).

With the latest order for twenty-one units, a total of ninety-eight type "3" diesel locomotives of the Birmingham/Sulzer/Crompton design is now being built for British Railways, by the Birmingham Railway Carriage & Wagon Co., Ltd. They are destined for the Southern Region where they will all be used for the Kent Coast scheme. Power for train heating is derived from a special generator, the armature of which is mounted on a common cast steel rotor with that of the main traction generator and auxiliary generator. The electrical equipment is of Crompton Parkinson supply. The locomotives are powered by Sulzer 8LDA28 diesel engines which develop 1,550 b.h.p., at 750 r.p.m. continuous.

New Philips Scottish Headquarters

A new building now under construction at the corner of Waterloo Street and Campbell Street, Glasgow, is to be taken over by Philips Electrical, Ltd., as its Scottish headquarters. The new building—a seven-floor tower and first floor covering a larger area—is the first large-scale commercial development in Glasgow since before the war. The overall dimensions of the seven floors in the tower will be 66ft by 49ft and those of the first floor will be 75ft by 66ft. It is expected that the present regional office, the Scottish stores and service department will move to the new premises towards the end of this year. The new building will have complete underfloor heating.

Electrical Contracting Wages

Arising from the recent dispute at the Shell Mex building, South Bank site, London, and the findings of the committee of investigation set up by the Minister of Labour, a provisional agreement has been reached between the Electrical Trades Union and the National Federated Electrical Association for increased payments. A sum of 5s per day worked will be paid in recognition of extra effort by operatives employed on the initial construction of buildings reasonably comparable with the Shell Mex building and the Petrochemical buildings at Urmston, Manchester, where building trade operatives are in receipt of bonuses or additional payments under payment-by-results schemes. The agreement is to operate for a period of six months and is terminable then unless renewed by the signatories.

Trade Announcements

Mr. J. H. Barham has been appointed Birmingham area representative for **Chilton Electric Products, Ltd.,** Hungerford.

The London Fan & Motor Co., Ltd., is now at 331, Sandycombe Road, Richmond, Surrey (telephone: Richmond 0157).

Mr. G. Goodger has been appointed by **Bulpitt & Sons, Ltd.,** as assistant representative to Mr. E. L. Pain, covering the south and south-east territory. He was previously senior showroom assistant with the South Eastern Electricity Board at Purley.

Pye Process Heating announces that Mr. J. J. Tyrrell is joining the company as a technical sales representative, as from 1st June. He will be covering the London area and Southern England, operating from his home in Richmond.

The Manchester depot of **Pritchett & Gold and E.P.S. Co., Ltd.,** has moved to 17, Rainforth Street, Longsight, Manchester, 13 (telephone: Rusholme 1551/2).

As from 11th June the telephone number of the Dundee branch of **British Insulated Callender's Cables, Ltd.,** will be altered to Dundee 25726/7.

The **Whitefield Machinery & Plant, Ltd.,** has moved to 48, Chatham Street, Edgerley Hill, Stockport, Ches. (telephone: Stockport 4471).

Change of Address

L. G. Mouchel & Partners, consulting civil engineers, are moving during the middle of June to offices at Southbank House, Black Prince Road, Albert Embankment, London, S.E.11 (telephone: Reliance 7691).

Price Increase

Line Equipment, Ltd., announces that as from 23rd May the prices of its products have been increased by 5 per cent.

NEXT WEEK'S E.T.U. CONFERENCE

ON the final agenda for the annual policy conference of the Electrical Trades Union, which opens on Monday at Hastings, are 216 motions and numerous amendments. Trade matters take up the bulk of the agenda, but there is the usual collection of motions on a variety of subjects, ranging from unemployment in Scotland to *apartheid* in South Africa.

Most of the trade motions are hardy annuals. Of the 30 on the electrical contracting industry, about 20 have been debated on many previous occasions. Four concerning apprentices call for increased rates of pay, day release with pay, a suspension of intake for six months "to ease up the ratio of apprentices to journeymen," and a holiday agreement similar to the existing agreement for adults. Tunbridge Wells branch considers that the country allowance is inadequate and Peterhead wants a guaranteed week comparable with the electricity supply agreement. A composite motion, sponsored by the Caerphilly, South Harrow and Worcester branches, calls for three weeks' annual holiday with full pay. On wages, Harlow branch suggests "in lieu bonuses" for members working alongside other tradesmen for whom a payment-by-results scheme is in operation. Carmarthen, London Telephone Engineers No. 1, Beckenham and Clapham urge between them immediate and substantial increases in the standard rates.

Wages in the electricity supply industry are confined to one composite motion, with two amendments. One of these, from Birmingham Jointers' branch, recommends a £10 minimum for the lowest paid workers, while London Station Engineers No. 1 branch calls for "the removal of the limitations in Clause 20 of the National Agreement," namely, arbitration as the final stage of negotiations.

Plymouth Supply branch is concerned with what it calls the "black book" and urges that any new methods instituted by any district in compiling the history of an employee shall be operated only in consultation with the unions concerned.

Southend Electronic Engineers branch considers the engineering agreements to be "completely out of date," and calls for their revision. Another motion presses for a substantial increase in minimum rates, but confines the demand to maintenance electricians and mates.

Two motions deal with the relations of the E.T.U. to the T.U.C. A composite one, supported by Barkingside, Cheltenham and Eastleigh, "views with alarm the rapidly deteriorating relations between the E.T.U. and the T.U.C." It calls upon the Executive Council "to do nothing to worsen this relationship; to make every effort to be more co-operative with the T.U.C.; and to use every endeavour to discuss any disagreements, so as to ensure that the former goodwill that existed is re-established."

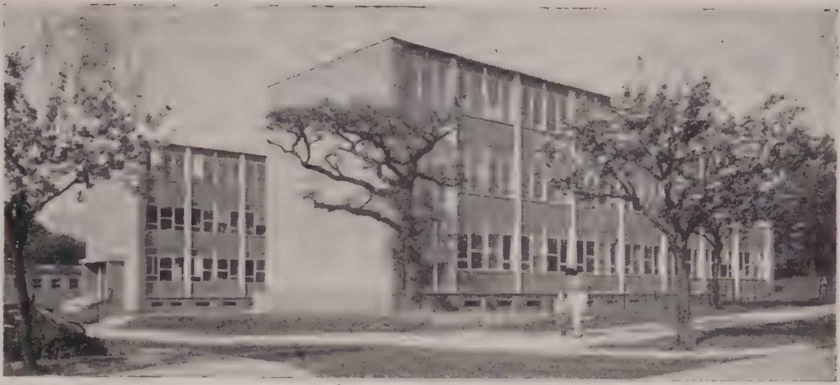
A motion from Kettering branch, while condemning the "vicious" press attack on the Union in connection with the T.U.C.'s inquiry into its affairs, declares that the attitude of mind that has prevailed within the Executive Council towards the inquiry cannot be accepted by the rank and file members. On the other hand a composite motion places on record its complete confidence in the elected leadership of the Union and "completely refutes and rejects the attacks made upon the leadership by press, radio, television and the Trades Union Congress General Council."

Accompanying the final agenda is the Executive Council's report to the conference. A document of some 180 pages, it shows that at 31st December, 1959, the membership of the Union was 233,579, an increase of 3,443 over the previous year.

GENERATION and DEVELOPMENT

Electricity Output and Sales

The steadiness of the rise in electricity sales is well brought out by the adjusted figures issued by the Electricity Council, in which allowance is made for weather conditions and the number of working days. For each of the first four months of the year the corrected rate has been over 12 per cent and for both March and April the figure is the same—12·7 per cent. The actual increases in these two months were 22·4 and 9 per cent respectively, reflecting the effect of the Easter holidays which fell in March last year but in April this year.



The new Birmingham headquarters of the C.E.G.B.'s Midlands Project Group

The return issued by the Ministry of Power shows that a total of 9,155 million kWh was generated in April by the C.E.G.B., the South of Scotland Electricity Board and the North of Scotland Hydro-Electric Board, compared with 8,454 million kWh in the corresponding month last year, an increase of 8·3 per cent. Of the 199·5 million kWh generated by the North of Scotland Board, 48·7 million kWh was exported to the South of Scotland Board, which also imported 3·1 million kWh (against 43·3 million in April, 1959) from the C.E.G.B. and 73·3 million kWh (against 19·1 million) from the Chapelcross nuclear power station of the U.K. Atomic Energy Authority.

There was only a small increase in plant installed last month, a 10 MW Metropolitan-Vickers set and a 180 klb/hr Foster Wheeler boiler being commissioned at the C.E.G.B.'s Spondon "H" station. In the North of Scotland a 70 kW set was taken out of service at Bowmore.

ELECTRICITY GENERATED AND SENT OUT FOR PUBLIC SUPPLY

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Output capacity MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total		
Central Electricity G.B.... ...	3,529	70	424·9	8,423	8	8,437	7,931	25,537
North of Scotland H.E.B. ...	4	—	1·3	9	185	200	198	1,043
South of Scotland E.B.	248	3	0·4	490	28	518	488	1,656
Total for April, 1960	3,781	73	426·6	8,922	221	9,155*	8,617	28,236
Corres. total for April, 1959 ...	3,698	101	310·3	8,261	183	8,454	7,956	26,114
Inc. or dec., per cent	+2·2	−27·4	+37·5	+8·0	+20·7	+8·3	+8·3	+8·1
Total to date (4 months), 1960 ..	18,096	367	1,839·5	41,765	1,085	42,907	40,445	
Total for corres. 4 months of 1959	16,886	419	1,373·3	37,334	794	38,179	35,984	
Inc. or dec., per cent	+7·2	−12·3	+33·9	+11·9	+36·7	+12·4	+12·4	

* The total figure includes generation by other methods amounting to 12 million kWh.

ELECTRICITY SENT OUT BY BOARDS FOR THEIR CONSUMERS

Board	Totals for April (million kWh)			Twelve Months' Totals Ended 30th April (million kWh)		
	1959	1960	Inc. or Dec. %	1959	1960	Inc. or Dec. %
London	650·4	683·5	+ 5·1	7,823·9	8,331·6	+ 6·5
South Eastern	440·6	501·0	+13·7	5,329·8	5,827·7	+ 9·3
Southern	579·9	658·9	+13·6	6,860·6	7,656·2	+11·6
South Western	280·8	308·7	+ 9·9	3,267·7	3,593·6	+10·0
Eastern	698·7	781·6	+11·9	8,413·8	9,251·8	+10·0
East Midlands*	588·3	629·2	+ 7·0	7,005·1	7,710·6	+10·1
Midlands*	787·9	851·2	+ 8·0	9,118·1	10,175·1	+11·6
South Wales*	445·5	484·6	+ 8·8	5,142·1	5,654·8	+10·0
Merseyside and N. Wales* ...	461·6	497·3	+ 7·7	5,449·1	5,984·5	+ 9·8
Yorkshire*	749·4	819·2	+ 9·3	8,717·1	9,847·5	+13·0
North Eastern*	456·3	476·4	+ 4·4	5,152·2	5,670·0	+10·1
North Western*	766·2	825·7	+ 7·8	9,076·3	9,890·5	+ 9·0
Total all Area Boards	6,905·6	7,517·3	+ 8·9	81,355·8	89,593·9	+10·1
Direct Supplies by C.E.G.B. ...	264·0	306·5	+16·1	3,075·3	3,635·4	+18·2
Grand Total	7,169·6	7,823·8	+ 9·1	84,431·1	93,229·3	+10·4
Mainly Industrial Areas*	4,255·2	4,583·6	+ 7·7	49,660·0	54,933·0	+10·6
Mainly Non-Industrial Areas ...	2,650·4	2,933·7	+10·7	31,695·8	34,660·9	+ 9·4
South of Scotland E.B.	566·5	612·5	+ 8·1	6,815·0	7,427·9	+ 9·0
North of Scotland H.E.B. ...	124·3	140·5	+13·1	1,554·6	1,682·0	+ 8·2

* Those in which industrial consumers took over 50% of the total sales in the preceding financial year.

Midlands Project Group Headquarters

On 19th May Sir Christopher Hinton, chairman of the Central Electricity Generating Board, formally opened the new headquarters of the Midlands Project Group at 341, Bournville Lane, Birmingham, and unveiled a commemorative plaque.

The building, designed by the Midlands Project Group, is a reinforced concrete structure of three storeys. The external walls are of conventional construction with steel-framed windows and brick panelling, and internally there is a modular system of steel partitioning. The building is heated by an off-peak electric underfloor heating system. There is a single-storey restaurant with a seating capacity of 130-150.

The Group, under Mr. R. R. Maddock, chief project engineer, is at present engaged on the following major constructional works:—Staythorpe "B," Willington "B," Drakelow "B" and "C," Spondon "H," Rugeley, Aberthaw and Uskmouth "B" power stations and the nuclear power station at Sizewell, in East Suffolk.

"Manweb's" New Tariff Proposals

An off-peak tariff and a new domestic tariff which are both expected to encourage greater use of electricity —particularly for floor warming or other forms of storage heating—were announced by the chairman of the

Merseyside and North Wales Electricity Board (Mr. D. H. Kendon) at a meeting of the Area Electricity Consultative Council held at Llandudno on Wednesday last. Such encouragement is already given in some of the Board's maximum demand tariffs, but generally these are appropriate only to fairly large commercial and industrial electricity consumers.

The lowest price in the present published block tariffs for farm, commercial and industrial consumers is 1·15d/kWh, and for domestic consumers 1·05d/kWh. The Board now intends to introduce an off-peak tariff of 0·9d/kWh, available to all consumers, subject to the electricity supplied at this cheap rate being used only for specified purposes. The consumer's wiring installation must be so arranged that the supply at the off-peak tariff can be controlled and metered separately from any other supply.

Domestic consumers may have the off-peak tariff if they wish, but the alteration which the Board is to make to the existing domestic tariff will be of greater interest to them. The present domestic tariff is a two-part tariff with a price of 5·75d/kWh for a first block of 12 kWh per room and a follow-on price of 1·05d/kWh. This is to be changed to a three-part tariff, the size and price of the first block being unchanged. There will then be a second block (of 200 kWh per room per quarter) at the present follow-on rate of 1·05d, and additional consumption will be charged at a new rate of 0·95d/kWh.

Nationalisation Case Judgment

The Central Electricity Generating Board was given judgment with costs last week in an action in the High Court arising out of the nationalisation of the former electricity undertaking of the Halifax Corporation. The Corporation was ordered to pay the Board £34,500 at present in the income tax suspense account of the general rate fund, with 4 per cent interest on the sum from 18th September, 1958. The Corporation denied that the money was part of the electricity undertaking's assets.

Mr. Justice Havers said that the money had been transferred from an account to set off the income tax and excess profits liabilities of the Electricity Department to a suspense account of the general rate fund by the borough treasurer the day before the Electricity Act came into force; he was not authorised to do that, and it was done as far as possible to prevent the money being vested in the Electricity Authority the next day.

The Corporation was granted a stay of execution for 21 days pending a possible appeal.

Retailing Electricity

The third 1960 Cantor Lecture at the Royal Society of Arts was delivered on Monday last by Mr. C. Robertson King, chairman of the Electricity Council; his subject was "The Retail Distribution of Electricity." After dealing with the "wholesale" side—the delivery of power from the grid to the Area Boards—Mr. King described Area and local distribution and then got on to the subjects of costs and tariffs and consumer service. He then gave as a typical example the operation of the East Midlands Electricity Board, of which he was chairman from 1948 to 1957. Mr. King concluded his lecture by stressing the need for improvement of load factor and for research into new and improved appliances and methods. He said that there was little doubt that the future prosperity of the country would be dependent in no small measure on the progress made in electricity supply.

Street Lamp Action

At the West London County Court last week Mrs. Constance Patricia MacGregor, of Upper Cheyne Row, Chelsea, S.W., lost an action in which she claimed £100 damages against Chelsea Borough Council for alleged nuisance caused by a street lamp shining into her bedroom and preventing her from sleeping; and an injunction restraining the Council from continuing the nuisance. Judge Geoffrey Howard said it was not a dispute in which he had any power to interfere. He found that the Council had acted in a bona fide and reasonable manner when carrying out their statutory duties to light the streets and said he hoped that their resolution in January to reconsider the question of screening certain lamps would not be affected by the result of the case. The Council were awarded costs.

OVERSEAS

Kariba Project Inaugurated

More than 3,000 people of many races were present on the south bank of the Zambesi on 17th May when Queen Elizabeth, the Queen Mother, moved a switch to start up the Kariba hydro-electric project in Southern Rhodesia (see *Electrical Review*, 20th May, pp. 947-955). Her Majesty, who said that the undertaking might in the future well rank with the seven wonders of the ancient world, then descended by lift into the underground power-house to inspect the workings and afterwards drove out of the exit tunnel to the canopied dais on the dam wall. In her capacity as president of the University College of Rhodesia and Nyasaland, she accepted a cheque for £10,000 from the consulting engineers and contractors which will go towards equipping the University's new Department of Geology. She was also presented with a personal gift of a wrist-watch from the "builders of Kariba."

In welcoming the Queen Mother, Sir Duncan Anderson, chairman of the Federal Power Board, spoke of some of the difficulties which had had to be overcome in the construction of the project, mentioning in particular the unprecedented flooding which occurred in 1958, destroying two bridges across the Zambesi and dislocating the works.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

MONDAY, 30th MAY to THURSDAY, 2nd JUNE

Bournemouth.—British Electrical Power Convention.

MONDAY, 30th MAY to FRIDAY, 3rd JUNE

Hastings.—Electrical Trades Union. Annual Policy Conference.

TUESDAY, 31st MAY

Aldershot.—A.S.E.E. Aldershot and Districts Branch. Visit to Huntley & Palmers, Ltd., Reading.

London.—Institution of Plant Engineers, London Branch. Visit to London Airport (Engineering Services).

WEDNESDAY, 1st JUNE

London.—21, Tothill Street, S.W.1, 6.30 p.m. Institution of Production Engineers. George Bray Memorial Lecture. "The Packaging of Engineering Products," by C. H. Bulmer.

Manchester.—Engineers' Club, Albert Square, 6.45 p.m. A.S.E.E. Manchester Branch. Annual general meeting.

64, George Street. Women's Engineering Society, Manchester Branch. Annual general meeting.

Nottingham. — Mechanics' Institution, Trinity Square, 7.30 p.m. A.S.E.E. Nottingham Branch. Annual general meeting.

Wood Green.—Civic Centre, Town Hall, 7.15 p.m. A.S.E.E. North London Branch. Annual general meeting.

Woolwich.—The Polytechnic, 7 p.m. Lecture on "MIMS, the latest Predetermined Motion Time."

WEDNESDAY, 1st JUNE to SATURDAY, 4th JUNE

Bath.—Bath and West Agricultural Show.

THURSDAY, 2nd JUNE

London.—At the Federation of British Industries, 21, Tothill Street, S.W.1. Central London Productivity Association. Conference on "People and Productivity."

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NEW ELECTRICAL EQUIPMENT

Welding Meter

A meter designed to measure the electrical conditions in an a.c. welding arc is announced by the ENGLISH ELECTRIC CO., LTD., Marconi House, Strand, London, W.C.2. The unit consists of a voltmeter, ammeter and watthour meter, showing the arc voltage and current and the total energy being consumed, and a protective relay all housed in a compact case (16½in by 5⅜in by 6½in), suitable for switchboard or wall mounting. The relay is incorporated to give protection against overcurrent in the event of the meter being used with an incorrect current transformer ratio. A four-range current transformer—from 100, 300, 500 or 1,000 A to 5 A—can also be supplied.

English Electric welding meter

One revolution of the watthour meter pointer is equivalent to 100 Wh at 100/5 A ratio. For other ratios, a multiplying constant must be used. The pointer can be re-set to zero after each welding operation, while the total watthours are shown on the meter register. The voltmeter is scaled 0-120 V and is marked 1 V per division between 20 and 45 V, the normal arc voltage range. The ammeter is scaled 0 to 120 A and reads direct for a current transformer ratio of 100/5 A.

Two-Speed Motors

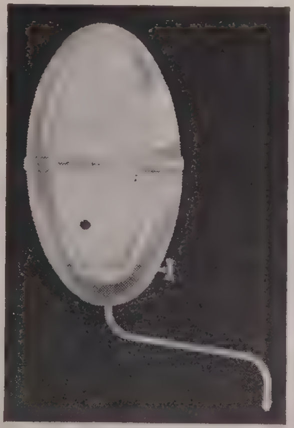
Two-speed electric motors which are not only smaller than conventional machines of similar rating but also lower in price have been developed by ASSOCIATED ELECTRICAL INDUSTRIES, LTD., Rugby, based on the results of investigations by Prof. G. H. Rawcliffe, of Bristol University (see *Electrical Review*, 22nd January, page 149). Where the duties of an induction motor require more than one speed, in a ratio other than 2 : 1, it has been the practice to use two stator windings. Professor Rawcliffe's work has shown that, with pole-amplitude modulation, a motor with a single winding can run at two speeds with a ratio less than 1·5 to 1, e.g. with pole numbers such as 6/8, 8/10 and 10/12.

An alternative system using fractional-slot windings, in which 1·5 to 1 is no longer the upper limit of the speed ratios available, has been evolved. Although this method requires the use of more leads and more switching than pole-ampltiude modulation, it offers greater freedom in matching the characteristics of the motor to the load.

The A.E.I. is now offering machines with pole numbers of 6/8, 8/10, 10/12, 12/14, 14/16 and upwards. In these cases, there are six brought-out leads and a simple switching arrangement. Machines with multiples of the above ratios will also be supplied (e.g. 12/16, 16/20), with similar leads and switching arrangement. With additional switching, machines with other speed ratios can be supplied. Where three or four speeds are required, change-pole machines with two stator windings will be available.

Water Heater

A water heater of unusual shape has been introduced by the MODERN EQUIPMENT CO., LTD., Court Ash, Yeovil, Somerset. Called the "Sincomatic," it breaks away from tradition in that the outer case is composed of spun aluminium, claimed to give maximum insulation, and the internal tank is surrounded by fibreglass. It has a capacity of 2 gal and there is a choice of either 2 or 3 kW loadings. The heater is thermostatically controlled and a neon indicator light is fitted. The design is unspoiled by connections and all fitting is from the fixing bracket side of the heater. It has an easily removable base-plate which simplifies element descaling, if and when required.

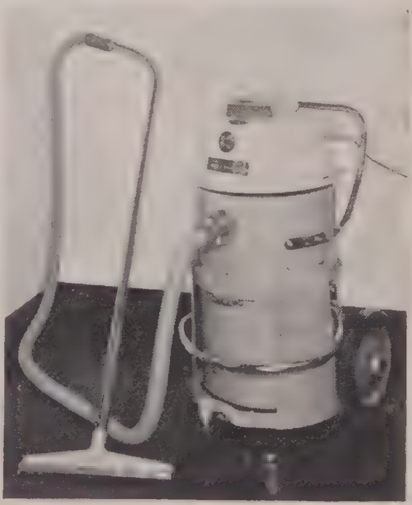


Modern Equipment Co. "Sincomatic" water heater

The de-luxe model is finished in an anodised colour range of gold, cherry red or Capri blue, and the standard enamel sprayed model is in white or cream. The "Sincomatic" complies with B.S. 843 and the prices are £16 2s 8d (de-luxe) and £14 19s 1d (standard), both prices inclusive of purchase tax.

Industrial Cleaning Machine

The "Jetstream" industrial cleaning machine, originally developed by the Kent Co., Inc. of New York, is now being manufactured in this country by the KENT FLOOR MACHINE CO., LTD., Speke, Liverpool, 24. The machine, which is somewhat revolutionary in appearance, incorporates many functional design features. It is instantly adaptable for the wet or dry cleaning of walls and floors and can also undertake a wide variety of other duties where a powerful and mobile suction unit is required. A 1 h.p. universal motor is provided in conjunction with a three-stage fan system, giving an air flow of 144 cu ft/min. A special wet shut-off device is incorporated and should the machine be misused on wet work, no moisture can reach the enclosed motor, which is cooled by a separate airstream.



Kent "Jetstream" industrial cleaning machine

A 16in diameter tank contains the retained waste, dry or wet. This tank is mounted on ball-bearing runners and is separated from the machine by a simple hand lever, making disposal easy and straightforward.

WORK OF THE N.P.L.

THE wide range of research topics in modern physics covered by the National Physical Laboratory is described in the annual report of the Laboratory for 1959, published for the Department of Scientific and Industrial Research by H.M. Stationery Office, price 8s.

The new Basic Physics Division has begun an investigation into different aspects of the physics of polymers to determine how the atoms are held together in plastics and other polymers, and how these arrangements of the atoms define their mechanical, electrical and thermal properties. New work is also reported from the C.M.E. Division, recently renamed the Autonomics Division. A start has been made on the problems of mechanical translation from Russian into English, using the ACE computer. Methods for self-optimisation of industrial control processes, e.g. simulating the operation of a distillation column on a computer, are being established. The programme of the Aerodynamics Division includes studies of the airflow around tall chimney stacks which have suggested methods of eliminating "flutter." One successful idea is to wind helical "strakes" round the chimney.

In June last year the new international yard and pound already legalised by Canada and the U.S.A. were adopted for scientific purposes. The Standards Division has completed the determination of the density of mercury by measurements on samples from the standards laboratories of Australia and the U.S.A. A start has been made on correlating U.K. and American time and frequency services. The scale of temperature between 10 and 90°K defined by the platinum resistance thermometer has been related to the thermodynamic scale by a helium gas thermometer. Comparisons are being made with the U.S.A. and Russia, with the intention of extending the international temperature scale below its present lower limit. Spectro-radiometric methods have been tried successfully by the Light Division in the establishment of a standard scale of colour temperature, and emphasis has been given to improving diffraction gratings for metrological purposes in industry.

The Metallurgy Division, now equipped with such apparatus as an electron microscope, soft X-ray spectrograph, mass spectrograph and optical spectrograph, is studying problems associated with precipitation processes in iron. By using the electron microscope, it is now possible to see dislocations, the faults in the atomic planes which weaken metals by one hundred to a thousand times.

Electric Vehicle Association Report

THE approximate number of electric vehicles in use in Great Britain and Northern Ireland at the end of 1959 was 36,555 (25,310 driver-seated and 11,245 pedestrian controlled vehicles). These figures are given in the annual report of the Electric Vehicle Association of Great Britain, which was presented at the Association's annual general meeting on 17th May.

In the report it was stated that the special endeavours by the E.V.A. to gain exemption of all electric vehicles from the test of road vehicles over ten years old were continued. Mention was also made of a joint meeting between electric vehicle manufacturers and representatives of the National Dairymen's Association, which was held to consider additional measures for making electric vehicles safer and less vulnerable to being started by unauthorised persons. The Ministry of Transport was informed of the Association's actions and the care taken to ensure maximum safety with electric vehicles. The Board of Trade decided to discontinue its demand on members for monthly returns of vehicle production and members agreed, under a special arrangement made by the Association, to submit returns on an annual basis.

Regarding the figures relating to the increase in electric vehicles in use, the report stated that it should be kept well in mind that such figures related only to registered vehicles and did not present the complete picture. Most of the vehicles going into industrial and hospital service were for use within private property and were not registered. In this regard it was important to note that of the specific inquiries circulated to members, nearly 60 per cent were for industrial and hospital service.

The report concluded with the statement that the year was a good one for electric vehicle manufacturing and the Association expressed appreciation and thanks to the British Electrical Development Association for the financial and other assistance rendered.

Traction Research and Education

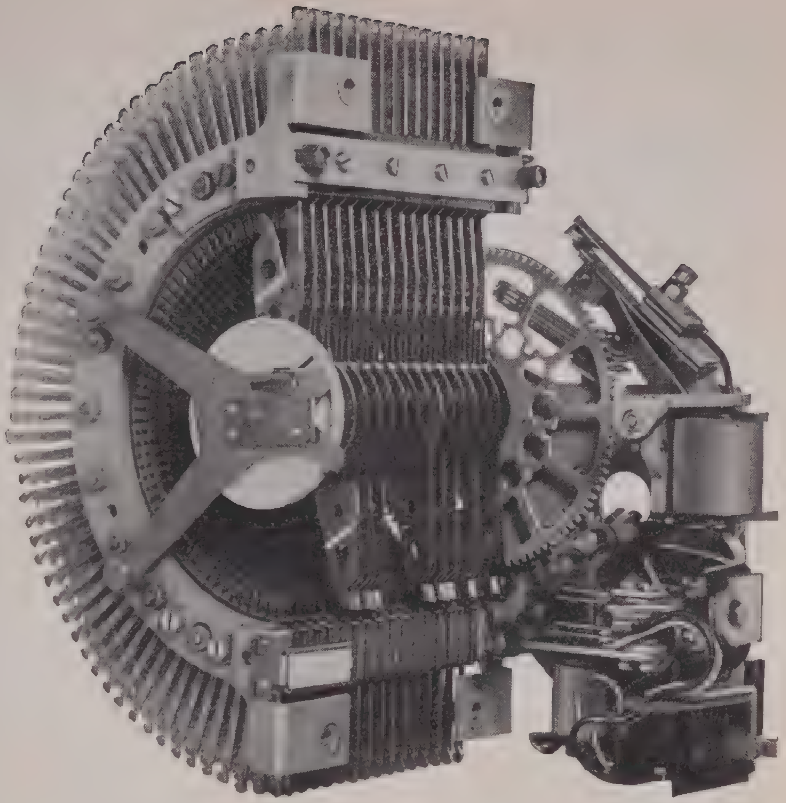
THE British Transport Commission, jointly with the British Electrical and Allied Manufacturers' Association, have sponsored and are financially supporting a new section for electric traction in the Department of Electrical Engineering of the Imperial College of Science and Technology, South Kensington. It will provide an academic centre, hitherto lacking in this country, for the post-graduate training of an additional supply of engineers for the railways and the manufacturers of traction equipment, and at the same time provide a contribution to the volume of research on electric traction problems and possibilities. The head of the Department, of which this section for electric traction will be part, is Professor A. Tustin, who, until he changed over to academic work in 1947, worked on the manufacturing side of electric traction.

Ten-month post-graduate courses on electric traction will commence in October next, and in each subsequent October, successful students being awarded a post-graduate diploma. Research will be carried out by the staff on selected problems relating to the electrification of railways and there will be places for a limited number of students for training in research over periods of two years or more as candidates for higher degrees, distinct from the men taking the 10-month tutorial courses. The 10-month courses will include lectures and extensive laboratory work. Apart from basic courses there will be additional courses selected according to the needs of individual students.

The laboratory work is being designed to assist students to grasp fundamental aspects of the topics of the course which are difficult enough to make such reinforcement desirable. The planning of a research programme, in conjunction with the railways and industry, will not be completed until the Reader has been appointed, but there are vast fields in which more knowledge is needed and to which a university laboratory may contribute, such as developments in rectifiers; the efficient use of a given weight of materials in motive equipment; commutation in d.c. machines fed from rectifiers and in a.c. commutator motors; and railway signalling, traffic control and the like. The College is endeavouring to have the new facilities fully available in October this year. The vacancy for a Reader has been advertised in a number of countries abroad as well as in Britain. The necessary laboratory equipment is now being planned in detail. Applications for admission to the course or for admission as research students in October should reach the department as soon as possible. The sponsors of the scheme have made available a small number of bursaries which will be available for selected students not otherwise provided for.

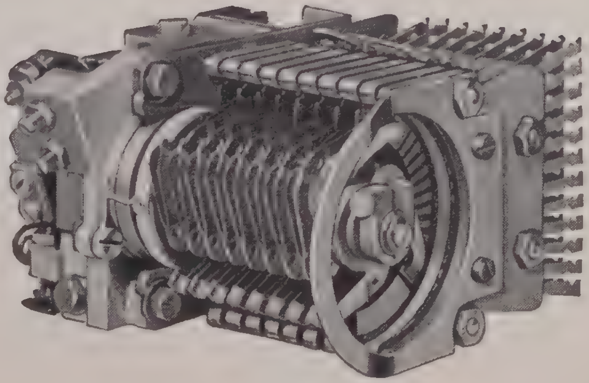
These 3 outstanding uniselectors

provide long life and reliability in operation



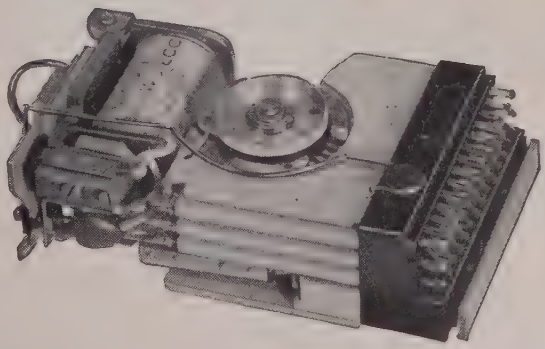
The high speed motor uniselector

has an availability of 52 outlets in a half revolution with up to 16 parallel channels, and is capable of high speed search if required. It is also suitable for scanning and other collection functions, or for the routing of information to a multitude of points. It can be brought to rest at any desired outlet by means of simple circuitry, and a homing drive is provided so that it can be readily restored to the normal position. Arrangements can also be made for step-by-step working.



The digit switch

is specifically designed for step-by-step operation in response to impulses, and has an availability of 12 outlets with 8 parallel channels. It may be used to set up a marking condition for the control of the Motor Uniselector.



The miniature uniselector

is a compact switch of unique design which occupies no more space than a standard 3000-type relay. It has an availability of 12 outlets with 3 parallel channels. A great advantage is that it incorporates a plug-in type of mounting so that the entire device can be removed and replaced without detaching any soldered connections.

AEI

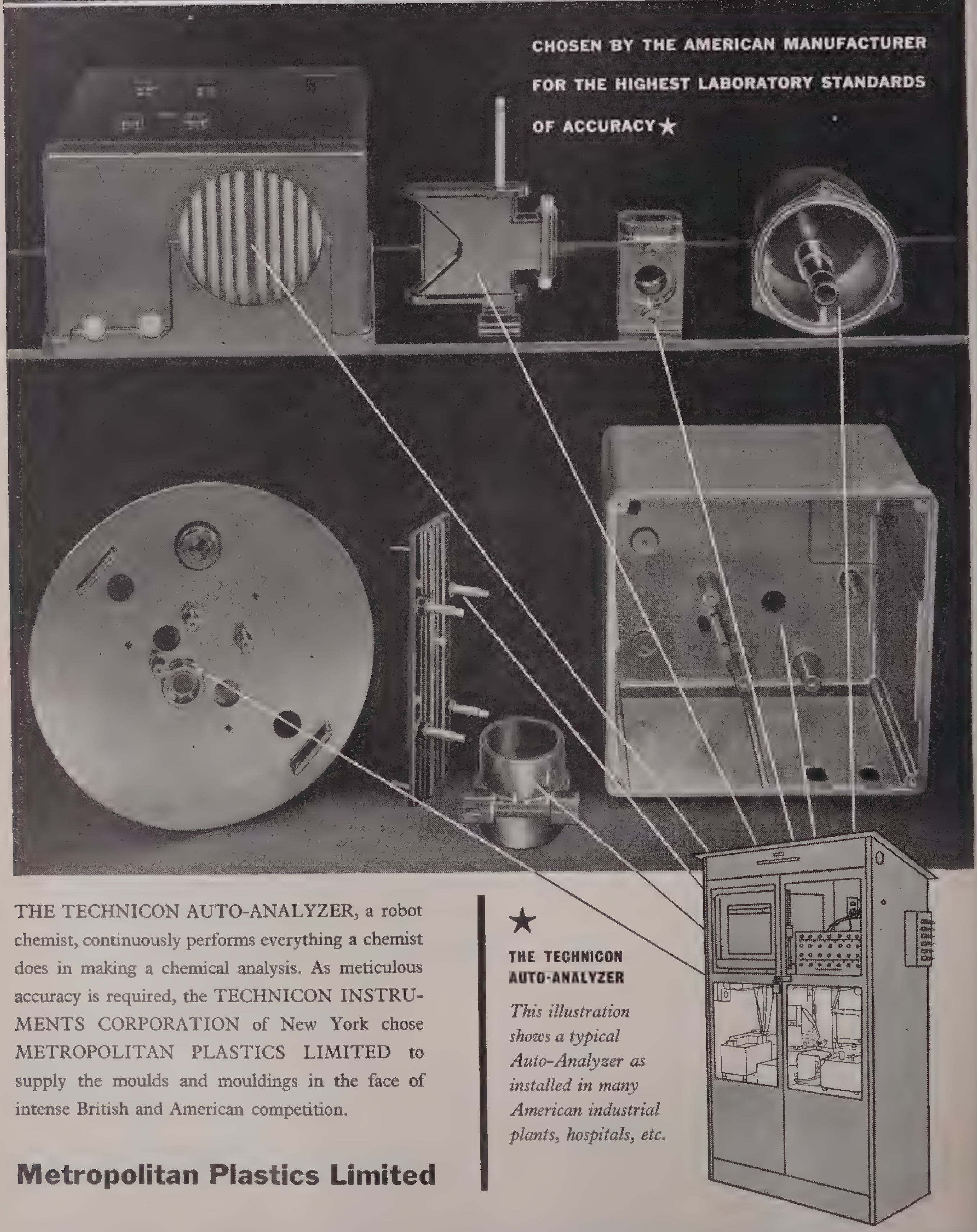
Full technical information will gladly be supplied on application

ASSOCIATED ELECTRICAL INDUSTRIES LTD.
Telecommunications Department
Telephone Apparatus Department PD7
Woolwich, London, S.E.18
Woolwich 2020 Ext.

PD 7/3

TA 2139

Metropolitan Plastics Limited


CHOSEN BY THE AMERICAN MANUFACTURER FOR THE HIGHEST LABORATORY STANDARDS OF ACCURACY ★

THE TECHNICON AUTO-ANALYZER, a robot chemist, continuously performs everything a chemist does in making a chemical analysis. As meticulous accuracy is required, the TECHNICON INSTRUMENTS CORPORATION of New York chose METROPOLITAN PLASTICS LIMITED to supply the moulds and mouldings in the face of intense British and American competition.

★
THE TECHNICON AUTO-ANALYZER

This illustration shows a typical Auto-Analyzer as installed in many American industrial plants, hospitals, etc.

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Glenville Grove · Deptford · London SE8 · Telephone TIDEWAY 1172 *Specialists in Thermo-setting Plastics*

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1953

4485. Minister of Supply.—Photoconductive cells. 13th May, 1954. (Cognate application 13168, 5th May, 1954.) (834658.)

1955

6598. Jackson, S. W., Robinson, S., and Howden, J. M. (trading as British Northern Electrical Appliances).—Counting mechanisms. 7th June, 1956. (834535.)

9206. Henley's Telegraph Works Co., Ltd., W. T.—Gas-filled electric cables. 6th April, 1956. (834536.)

15962. Babcock & Wilcox, Ltd.—Power plants with vapour operated prime movers and gas turbines. 1st June, 1956. (834784.)

16091. National Research Development Corporation.—Switching devices. 29th May, 1956. (834539.)

16482. Metropolitan-Vickers Electrical Co., Ltd.—Irradiation of substances by electronic bombardment. 5th July, 1956. (834540.)

17548. English Electric Co., Ltd.—Back e.m.f. responsive electric circuit arrangements and electric motor control systems. 18th June, 1956. (834785.)

18823. Electric & Musical Industries, Ltd.—Cathode-ray tube arrangement. 14th June, 1956. (834542.)

19693. Metropolitan-Vickers Electrical Co., Ltd.—Linear electron accelerators. 6th July, 1956. (834543.)

21349. British Telecommunications Research, Ltd.—Electrical filters. 11th July, 1956. (834544.)

21509. Minister of Supply.—Photoconductive cells. 13th May, 1954. (Divided out of 834658.) (834659.)

21703. Allgemeine Elektricitäts-G.m.b.H.—Arrangement for selective protection of a substation in power distribution systems. 6th July, 1956. (834789.)

31653. British Insulated Callender's Cables, Ltd.—Electric capacitors and their manufacture. 2nd November, 1956. (834549.)

33422. Igranic Electric Co., Ltd.—Electric positional control apparatus. 22nd February, 1957. (834406.)

1956

3263. Cole, Ltd., E. K., and Price, A. J.—Direction finding apparatus. 2nd May, 1957. (834794.)

3345. National Presto Industries, Inc.—Electrically heated devices with plug-in thermostat. 2nd February, 1956. (834407.)

5558. M.K. Electric, Ltd., Arnold, C. L., Dowsett, R. W., and Sharman, A. V.—Flush mounted electric switches. 15th March, 1957. (834798.)

7412. Loepfe A.G., Geb.—Electro-optical sensing equipment for counting, regulating, control and like purposes. 9th March, 1956. (834555.)

8322. General Electric Co.—Coupling of electromagnetic energy. 16th March, 1956. (834412.)

11055. Tardney International Corporation.—Electrode assembly for an electric battery. 11th April, 1956. (834802.)

12124. National Research Development Corporation.—Grid controlled space discharge devices. 20th April, 1956. (834414.)

13200. General Electric Co.—Apparatus for testing magnetic material. 30th April, 1956. (834887.)

15142. Busch-Jaeger Dürener Metallwerke A.G.—Starter mounting for fluorescent tube lamps. 15th May, 1956. (834564.)

15905. International Business Machines Corporation.—High frequency transistor. 23rd May, 1956. (834420.)

36718. General Electric Co., Ltd.—Electrical apparatus for providing an indication of the relative positions of relatively movable means. 26th November, 1957. (834588.)

38582. General Electric Co., Ltd.—Thermocouples. 13th December, 1957. (834593.)

1957

2123. Philips Electrical Industries, Ltd.—Method of manufacturing a light-pervious element for use in lighting fittings. 21st January, 1957. (834597.)

2145. Metropolitan-Vickers Electrical Co., Ltd.—Nose suspension for electric traction motors. 18th April, 1958. (834920.)

6237. Schulten, R.—Nuclear reactor. 25th February, 1957. (834829.)

8473. General Electric Co., Ltd.—Rectifier assemblies and supporting arrangements therefor. 14th March, 1958. (834464.)

8775. National Research Development Corporation.—Microwave modulators. 11th March, 1958. (834465.)

16104. Brayhead (Ascot), Ltd.—Holders for thermionic valves or other electrical devices having projecting terminal prongs. 21st May, 1958. (834836.)

37013. Metropolitan-Vickers Electrical Co., Ltd.—Process for the purification of semiconductor material. 12th November, 1958. (833928.)

1958

1053. Collins Radio Co.—Waveguide switch. 10th January, 1958. (833937.)

1133. Westinghouse Electric Corporation.—Control rod assemblies for nuclear reactors. 13th January, 1958. (834365.)

2130. Standard Telephones & Cables, Ltd.—Circuit arrangement for current regulation with the aid of transistors. 22nd January, 1958. (834367.)

6093. Bendix Aviation Corporation.—Method and arrangement for mounting an ultrasonic transducer unit on an ultrasonic wave transmitting element. 25th February, 1958. (833838.)

7276. Smith Hobson, Ltd.—Transformers. 6th March, 1958. (833842.)

8218. National Cash Register Co.—Method of making bi-stable state magnetic ferrite cores. 14th March, 1958. (833845.)

10651. Sylvania Electric Products, Inc.—Inductor having a bent strip core. 2nd April, 1958. (834165.)

12198. Compagnie Générale d'Electricité.—Electric cable in a waterproof grooved metal sheathing. 17th April, 1958. (834182.)

13027. Wago-Klemmenwerk G.m.b.H.—Spring loaded clamping connector for electric conductors. 24th April, 1958. (834171.)

15873. Smit & Co.'s Transformatorenfabriek N.V., W.—Transformers or choking coils. 16th May, 1958. (833858.)

16366. Bendix Aviation Corporation.—Electrical contact assembly. 21st May, 1958. (833963.)

17408. Du Pont de Nemours & Co., E. I.—Electrolytic cells. 30th May, 1958. (833861.)

17682. Westinghouse Electric Corporation.—Control systems for regulating the line voltage of a power source or power line. 3rd June, 1958. (833965.)

18511. Western Electric Co., Inc.—Printed electric circuits. 10th June, 1958. (834181.)

18921. National Cash Register Co.—Electrical impulse delay circuit. 13th June, 1958. (833967.)

19335. Allied Control Co., Inc.—Electric tumbler switches. 17th June, 1958. (834389.)

21050. Otis Elevator Co.—Control systems for electric lift motors. 1st July, 1958. (833968.)

21752. Andreasen, J. S.—Electric coupling means for making tapping connections. 7th July, 1958. (833911.)

24465. Sylvania Electric Products, Inc.—Frame grid for electron discharge devices. 29th July, 1958. (833916.)

24768. Siemens & Halske A.G.—Magnetic contacts in sealed protective tubes. 31st July, 1958. (833917.)

25525. Mullard, Ltd.—Travelling wave tubes. 8th August, 1958. (833919.)

26285. General Electric Co.—Silicon carbide semiconductor devices and method of preparation thereof. 15th August, 1958. (833971.)

32808. Telefonaktiebolaget L. M. Ericsson.—Circuit arrangements for automatic telephone exchanges. 18th July, 1957. (Divided out of 834203.) (834204.)

33205. Telefunken G.m.b.H.—Mechanically controlled pulse generators. 17th October, 1958. (833978.)

34317. Machlett Laboratories, Inc.—Beam forming electron tubes. 27th October, 1958. (833979.)

36488. Standard Telephones & Cables, Ltd.—Transistor circuits. 13th November, 1958. (833872.)

37537. Standard Telephones & Cables, Ltd.—Electric carrier wave modulating arrangements. 21st November, 1958. (834194.)

42177. Soc. d'Electronique et d'Automatisme.—Electrical bi-stable devices. 31st December, 1958. (833980.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 11th June:—

Canolectric. No. 798,436. Class 7. Electrically operated can opening machines, and can opening machines incorporating electrically operated knife sharpeners.—Pifco, Ltd., Pifco House, Watling Street, Manchester, 4.

Mixoblen. No. 785,386. Class 7. Electrically operated mixing machines for domestic use.—Esge Gschwend & Spingler KG. Electromotoren-und Apparate-bau, Neuffen-Wurttemburg, Germany. Address for service, c/o H. D. Fitzpatrick & Co., 94, Hope Street, Glasgow, C.2.

Micro-Distancer. No. B791,818. **Radiotape.** No. B791,821. Class 9. Electronic distance measuring instruments and apparatus. **Hydrodist.** No. B791,819. **Aerodist.** No. B791,820. Class 9. Electrical and radio line measuring instruments and apparatus.—Tellurometer (Proprietary), Ltd., Plumstead, Cape Province, South Africa. Address for service, c/o Joseph Harris & Co., 63, East Walk, East Barnet, Herts.

Dame. No. 800,137. Class 9. Electrical and electronic apparatus and instruments and parts, but not including galvanic cells or batteries.—De Havilland Propellers, Ltd., Manor Road, Hatfield, Herts.

Sappho. No. 800,320. Class 9. Sound recording and sound reproducing apparatus and instruments; radio, telephonic, telegraphic and television apparatus and instruments, etc.—Trix Electrical Co., Ltd., 1-5, Maple Place, Tottenham Court Road, London, W.1.

Silcad. No. 800,357. Class 9. Electric batteries.—Yardney Electric Corporation, New York, U.S.A. Address for service, c/o Dr. W. Wolff, 78, Woodlands, London, N.W.11.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—Shortland County Council, N.S.W. 16th June. Paper-insulated, lead-covered, single-wire armoured cable. (E.S.B. 12483/60.)*

Electricity Commission of New South Wales, Sydney. 27th June. 3·3 kV, 150 MVA air break switchgear. (E.S.B. 13526/60.)*

Postmaster General's Department, Melbourne. 21st July. Rural carrier telephone equipment. (E.S.B. 13299/60.)*

Brisbane City Council. 8th July. Electrical control switchboards and instruments for Tennyson power station. (E.S.B. 13135/60.)*

Electricity Trust of South Australia, Adelaide. 23rd June. Transmission line fault locator. (E.S.B. 13288/60.)*

British West Indies.—Trinidad and Tobago Electricity Commission, Port of Spain. 20th June. 66/33 kV, 25,000 kVA transformer. (E.S.B. 13295/60.)* 33/13·2 kV, 2,000 kVA power transformer. (E.S.B. 13292/60.)* Two 33/12 kV, 1,000 kV power transformers. (E.S.B. 13291/60.)* Two 66/12 kV, 4,000 kVA transformers. (E.S.B. 13294/60.)* 33/12 kV, 3,000 kVA power transformers. (E.S.B. 13293/60.)*

Clay Cross.—U.D.C. 10th June. Group "A" street lighting equipment. (See this issue.)

Down.—County Health Committee. 17th June. Electric lighting and heating installation at a new child welfare clinic, Park Avenue, Newcastle, Co. Down. Barrett & Agnew, 420, Ravenhill Road, Belfast.

East Midlands.—Ministry of Transport. 10th June. Roundabout lighting, Stamford By-Pass. (See this issue.)

Essex.—County Council. Electrical installations in schools. (See this issue.)

Gateshead.—Corporation. Electrical installation in Gateshead Technical College, Stage III. (See this issue.)

Grimsby.—North East Lincolnshire Water Board. 21st June. Pumping plant and equipment at Tetney pumping station. C. Cooper, engineer and manager, Town Hall Square.

Havant and Waterloo.—U.D.C. 11th June. Electric cable and fittings (Schedule No. 14), for the year ending 31st July, 1961. Surveyor, 1, Park Road North, Havant.

India.—Punjab State Electricity Board, Patiala. 22nd July. Power transformers and switchgear for the 33/66 kV step-up substation at Delhi. (E.S.B. 13534/60.)*

Gujarat Electricity Board, Baroda. 25th July. Transmission lines and towers, insulators, cables and accessories. (E.S.B. 13545/60.)*

Inverness.—County Council. Street lighting equipment. (See this issue.)

Kuwait.—Department of Electricity, Water and Gas. 15th June. 11 kV overhead line equipment. (E.S.B. 13259/60.)*

Manchester.—Corporation. 28th June. 415 V cables and auxiliary equipment for Davyhulme sewage works extensions. (See this issue.)

Paraguay.—Ministry of Public Works and Communications, Asuncion. 17th June. Three electric lifts. (E.S.B. 13247/60.)*

Portrush (Co. Antrim).—Coleraine and Portrush Hospital Management Committee. 14th June. Electrical engineering services at the new boilerhouse, Hopefield Hospital. W. & M. Given, consulting engineers, 1, Waterside, Coleraine.

Romford.—Corporation. 20th June. Groups "A" and "B" street lighting equipment. (See this issue.)

South Africa.—Durban Corporation. 17th June. Private branch exchange switchboards. (E.S.B. 12625/60.)*

Stores Department, South African Railways, Johannesburg. 17th June. Carrier telephone equipment. (E.S.B. 13287/60.)*

Sudan.—Controller of Stores, Ministry of Works, Khartoum. 21st June. Electric lamps. (E.S.B. 12699/60.)*

Sudan Gezira Board, Barakat. 18th June. Ten 4·5 kW diesel generating sets. (E.S.B. 13554/60.)*

Thailand. — Metropolitan Electricity Authority. 10th June. Lightning arrestors, fuse cut-outs, fuse links, and disconnecting switches. (E.S.B. 13236/60/I.C.A.)*

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Barrow-on-Soar.—Council chamber, offices, etc., for R.D.C.; surveyor, 31, Fowle Street, Rothley, Leics.

Beaconsfield.—Extension to Ponds Home for Spastics (£55,000); Burgess, Holden & Watson, architects, 3, Burkes Parade.

Biggleswade.—Houses (48), London Road; A. G. Baxter, Ltd., 24, Regent Street, Stotfold.

Blackrod (Lancs).—Houses (54); W. Hulbert, clerk, Council Offices, Blackrod, near Chorley.

Brighton. — Laboratory, classroom and studio block, Brighton and Hove School for Girls; Anthony Greenwood, architect, Broadway Court, London, S.W.1.

Bristol.—Works extensions; G. B. Britton & Sons, Ltd., Kingswood Works.

Supermarket, Cannon Street, Bedminster; Wilkins & Coventry, Ltd., 91, Cumberland Road.

Cupar (Fife).—High school (£329,000); R. S. Lawrie, county architect, County Buildings, Cupar.

Dorchester.—Laboratory block for Hardy's School; Lambert & Oliver, architects, 35, South Street, Bridport.

Ellesmere Port.—Public library, Civic Centre; Gornall, Kelly & Partners, Council's architects, 155, The Albany, Old Hall Street, Liverpool.

Garforth (Yorks.). — Secondary school (£725,000); county architect, Westfield Road, Wakefield

Glasgow.—Multi-storey flats on 54-acre site at Maryhill Barracks; director of housing, 20, Trongate.

Haslingden.—Grammar and secondary schools; county architect, County Offices, Fishergate Hill, Preston.

Hull.—Central abattoir, Commercial Road; A. Rankine, city architect, Guildhall.

Keighley.—Dwellings (74), Low Bank estate; E. G. Felgate, architect, College Street.

Lancing (Sussex).—Additions to County Secondary School, Boundstone Lane (£47,520); county architect, County Hall, Chichester.

Letchworth.—Hotel, with ballroom, restaurant, etc. (£130,000); Charrington & Co., Ltd., Anchor Brewery, Mile End Road, London, E.1.

Llandudno. — Residential school for physically handicapped children; director of education, Education Offices, Caernarvon.

London.—Central block, St. James' Hospital, Balham (£217,500); H. A. Sandford, heating and electrical consultant, 2, Gate Street, W.C.2.

Showrooms and offices, King's Road, Chelsea; E. A. Stone, Toms & Partners, architects, 28, South Audley Street, W.1.

Londonderry. — School, Springtown (£150,000); A. T. Marshall, architect, 1, Harbour Square, Londonderry.

Luton.—Development of Luton and Dunstable Hospital, Dunstable Road (£500,000); regional architect to Hospital Board, 40, Eastbourne Terrace, London, W.2.

March (Cambs.).—Baptist church; Smart & Partners, quantity surveyors, Market Place Chambers, Peterborough.

Newbury.—Bank premises and offices, 18-19, The Broadway; Lloyds Bank, Ltd., 71, Lombard Street, London, E.C.3.

Paisley.—Extensions to Technical College (£500,000); Allison & Hutchison Partners, architects, 4, Rothesay Terrace, Edinburgh.

Penrith.—Development works at Cumberland Westmorland Farm School, Newton Rigg (£145,000); J. H. Haughan, county architect, 15, Portland Square, Carlisle.

Peterborough.—Third (£152,960) and fourth (£44,268) instalments of Technical College and final stage of King's School modernisation; architect, Joint Education Board, Bridge Street.

Block of flats, Oundle Road; city engineer.

Poole.—Central Clinic (£60,000); Farmer & Dark, architects, 14, High Street.

Prescot.—Houses and maisonnettes (130), Elm House/Derby Street site; Gornall, Kelly & Partners, Council's architects, 155, The Albany, Old Hall Street, Liverpool, 3.

Rotherham.—Two-storey civic restaurant proposed on the Odeon car park site; E. J. Manson, borough surveyor, Municipal Offices.

Sheffield.—Metallurgy department for University; Hoare, Lea & Partners, heating and electrical consultants, 23, St. James Road, Edgbaston, Birmingham.

Southampton.—Teaching block for Training College, The Avenue; Richard Sheppard, Robson & Partners, architects, 5, Southampton Place, London, W.C.1.

Twickenham.—Four-storey offices and flats, Portsmouth Road and South Lane; Kingston, Ltd., 145, London Road, Kingston-on-Thames.

West Sussex.—Fire station and divisional headquarters at Worthing and stage 1 of new school at Yapton, Arundel; county architect, County Hall, Chichester.

Whickham (Co. Durham).—Houses (71), Dunston; Fennell & Baddiley, architects, Bridge End Chambers, Chester-le-Street.

Whitley Bay.—Extensions to Y.M.C.A. centre at South Parade (£30,000); S. W. Milburn & Partners, architects, 9, Esplanade, Sunderland.

Wilton.—Houses (40), Bulbridge; Potter & Hare, architects, De Vaux House, The Close, Salisbury.

Wimbledon.—Flats (28), Lansdowne Road; Michael H. Brashier, architect, 11, Gayfere Street, London, S.W.1.

Wolverhampton.—Houses (66), Pond Lane; borough engineer, Town Hall.

Worthing.—Nine-storey block of flats, 103/7, Brighton Road; Westminster Construction Co., Ltd., Westminster Palace Gardens, London, S.W.1.

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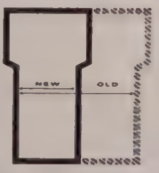
* This information is extracted from the Board of Trade *Export Service Bulletin.* Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given.

THE NEW TUDOR 'SAFETYLYTE' EMERGENCY LIGHTING EQUIPMENT

There is now an advanced version of the well-established Tudor 'Safetylyte' Emergency Lighting Equipment—the equipment that springs automatically into action the moment any interruption occurs in the normal mains supply, and provides emergency lighting protection in any type of public building.

This advanced equipment makes full use of the new Tudor High Performance Cell*, and is housed in a cubicle of improved design. The larger cubicles are now constructed of folded sheet steel with the instrument panel recessed and the front door hinged to give ready access to internal components. The equipment is available in both maintained and non-maintained types. For small lighting loads, wall-mounted cubicles (employing automatic mercury relay in place of a contactor) can be supplied. Self-contained trickle charge/floating battery equipment has also been designed for small buildings.

***The new Tudor High Performance Cell**



Provides a saving in space of up to 50% when compared with BS sealed cells, while retaining the advantages of long life, reliability and negligible maintenance.

Improved Switch Tripping Equipment

Tudor Switch-tripping units are now being fitted with the new High Performance Cell. The cubicles have also been redesigned and are available in folded sheet steel or wooden cabinet construction. The charger can now be used for both trickle and quick charging.

T174

Tudor SAFETYLYTE EMERGENCY LIGHTING EQUIPMENT

THE D.P. BATTERY CO. LTD, MANUFACTURERS OF KATHANODE AND TUDOR BATTERIES, BAKEWELL, DERBYSHIRE · TELEPHONE: BAKEWELL 581-5

BOLTON'S

H. C. COPPER FOR RAILWAY ELECTRIFICATION

H.C.COPPER COMMUTATOR SEGMENTS

H.C.COPPER STRIP

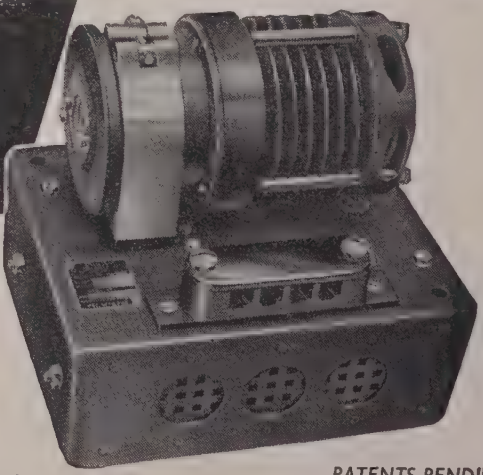
One of the latest Type '2' Diesel-Electric locomotives being supplied by The Birmingham Railway Carriage & Wagon Co. Ltd. to British Railways. The locomotives have Crompton Parkinson Ltd. electric equipment. Copper supplied by Thomas Bolton & Sons Ltd. is used for the commutators and for some of the windings of the electric equipment.

THOMAS BOLTON & SONS LTD

Head Office: Mersey Copper Works, Widnes, Lancashire Telephone: Widnes 2022
London Office & Export Sales Dept.: 168 Regent St., London, W.1. Telephone: Regent 6427

cvs-543

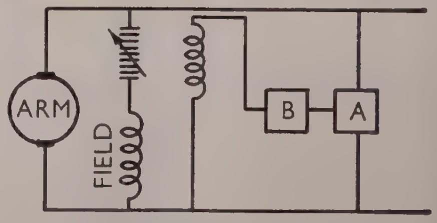
TRANSISTORISED AUTOMATIC VOLTAGE REGULATORS



REGISTERED TRADE MARK

Model shown is for the control of a 28 Volt D.C. generator for use on aircraft.

PATENTS PENDING



A=REFERENCE BRIDGE
B=TRANSISTOR AMPLIFIER

Regulation closer than ± 1% between extremes of temperature from −60°C to +70°C.
Speed of response 50/60 milliseconds.
For industrial purposes at normal ambient temperatures regulation within ± 0·5%.
Dimensions 5″ x 6″ x 5½″ high. Weight 4lbs.

NEWTON DERBY

NEWTON BROS (DERBY) LTD
ALFRETON ROAD · DERBY
Phone: Derby 47676 (4 lines) *GRAMS: DYNAMO · DERBY*
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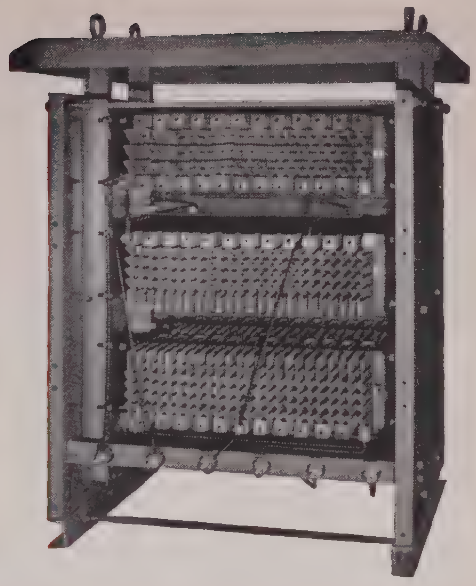
Let Fawcett carry the load



● F. P. SERVICE **RESISTORS**

Unbreakable. Rustless. Rigid. Weatherproof or open types built to any specific rating. Grids of top grade materials to suit ohmic values required. Spot welding of grids prevents non-homogeneous contact joints. Banks easily removed—no dismantling required. For Industrial, Traction, Power Station and Marine installation.

● **CUBICLES AND PANELS** FOR SWITCHGEAR AND INSTRUMENTS

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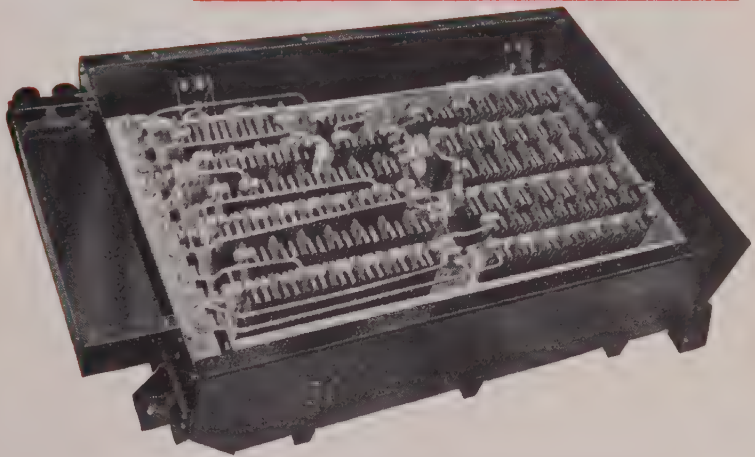

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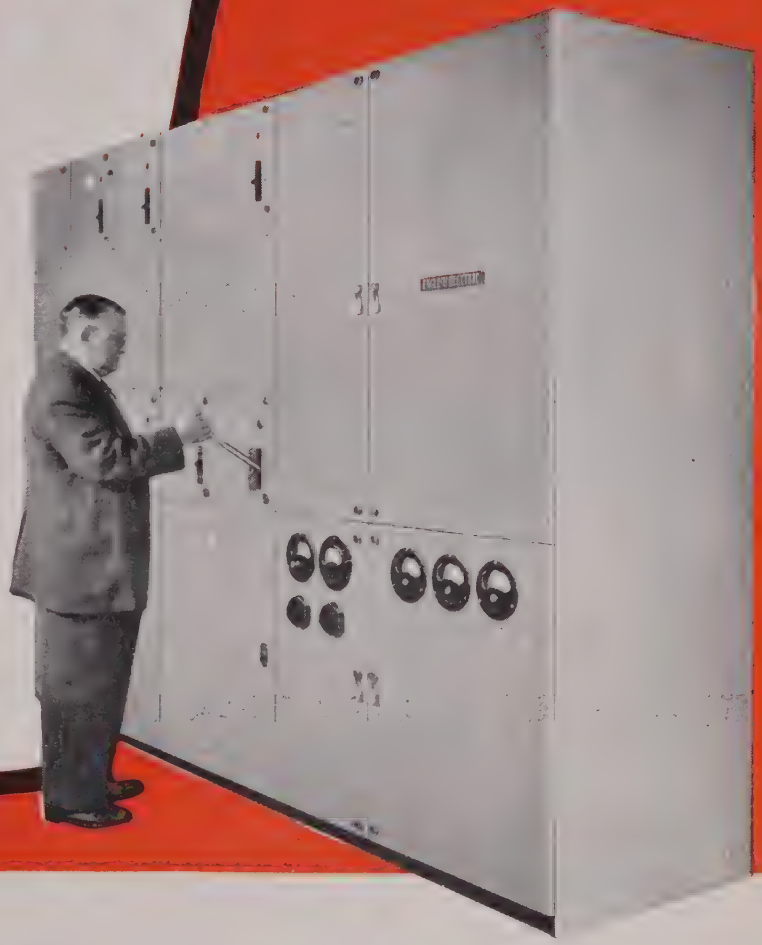
The illustration shows a composite 'Superform' switchboard installed in the substation of a large warehouse in the Midlands. The switchboard accommodates both the Supply Authority's open type substation equipment and the outgoing circuits to the warehouse within the one unit. The busbars of the substation board and outgoing 'Superform' section are coupled together, both electrically and mechanically, making the composite Switchboard a complete entity.



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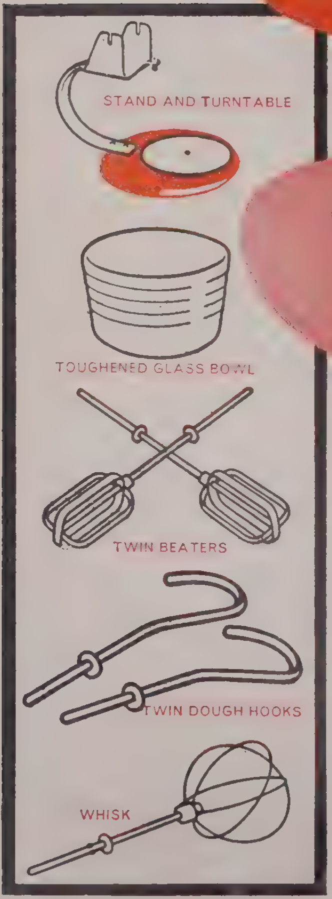

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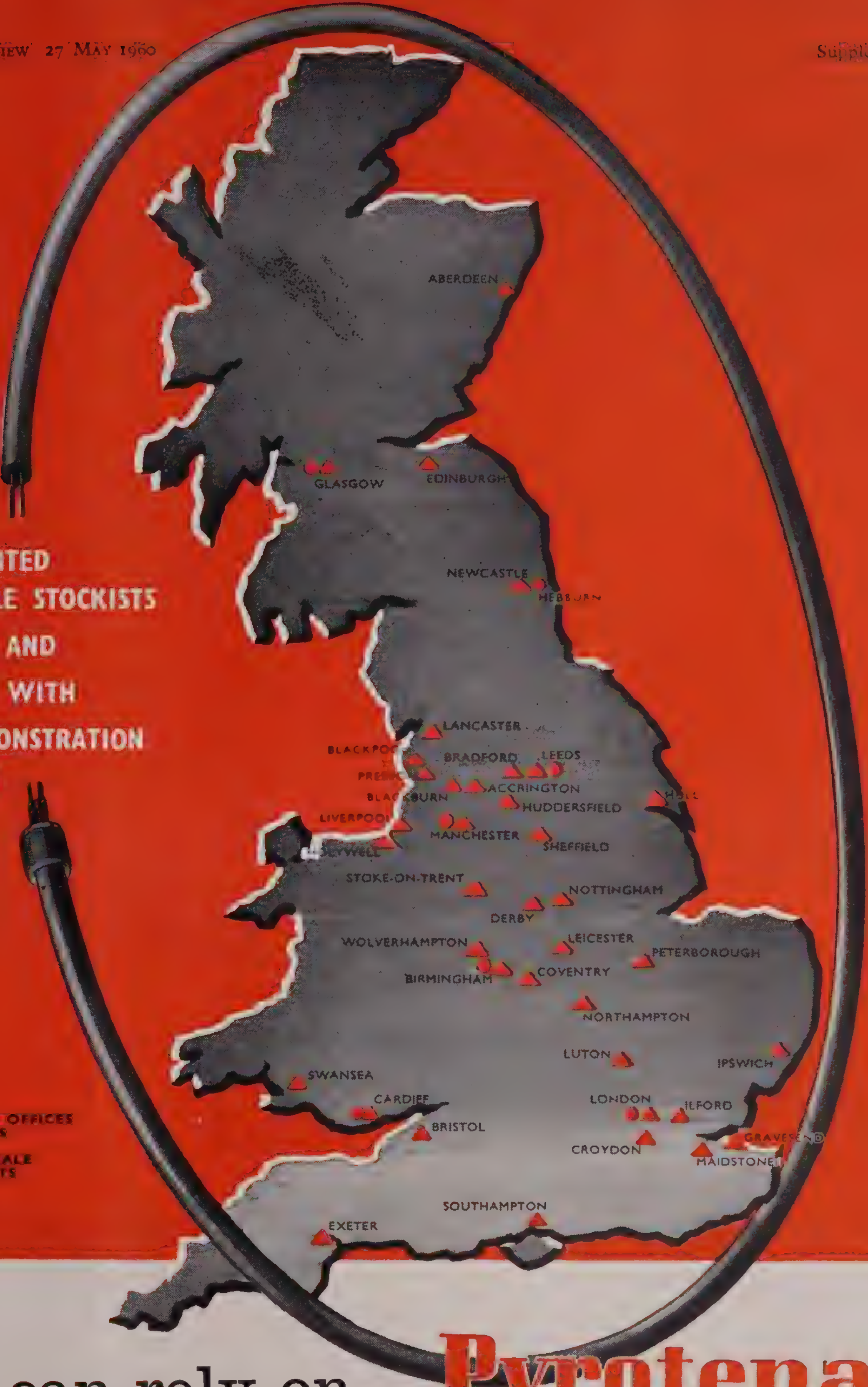

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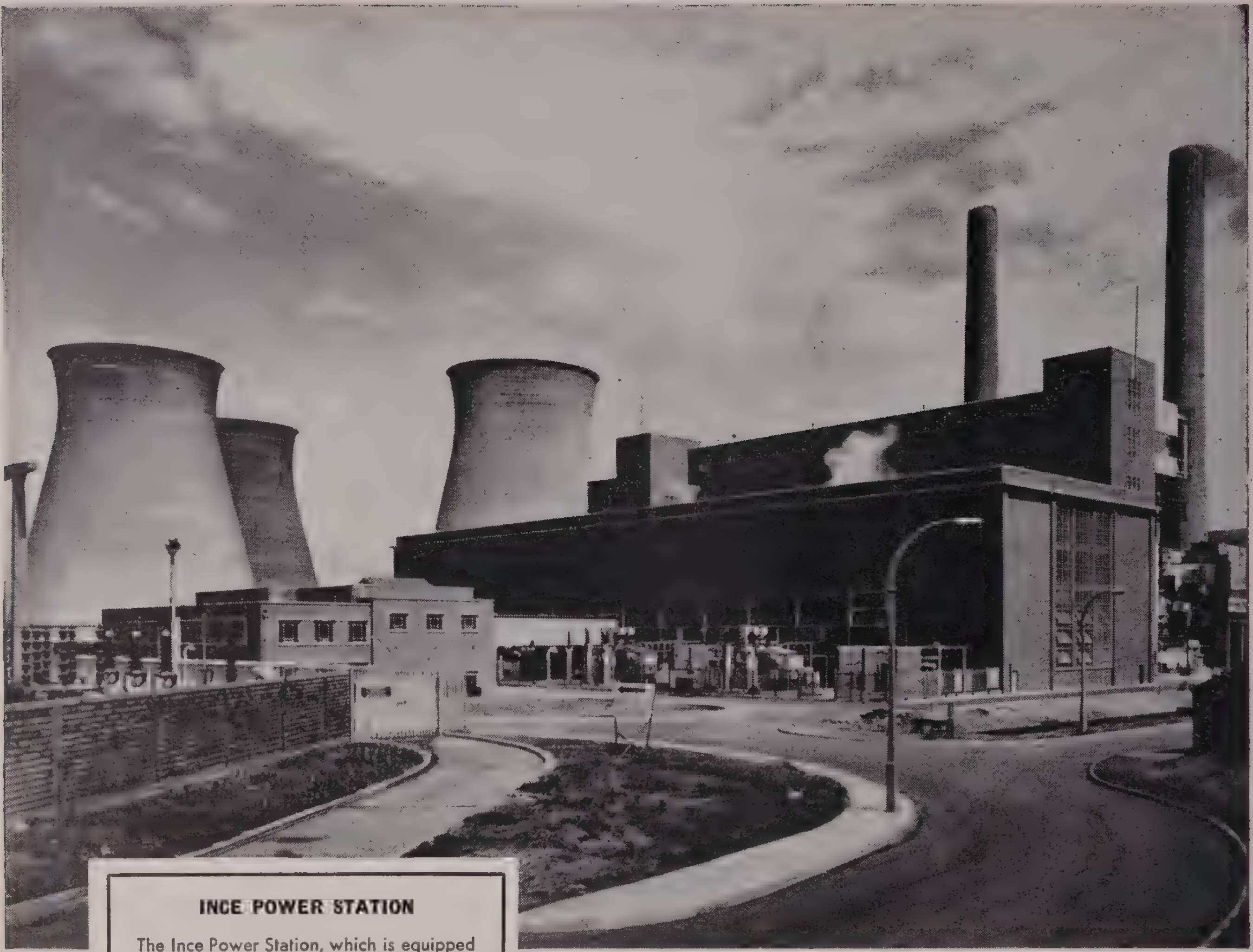

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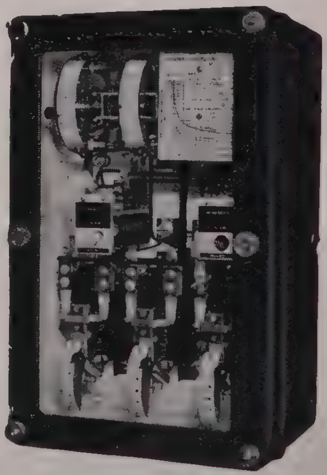

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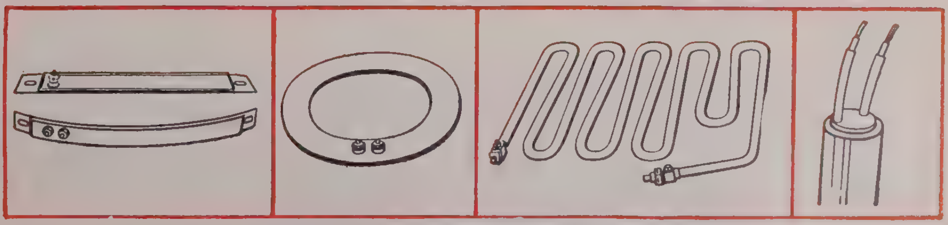

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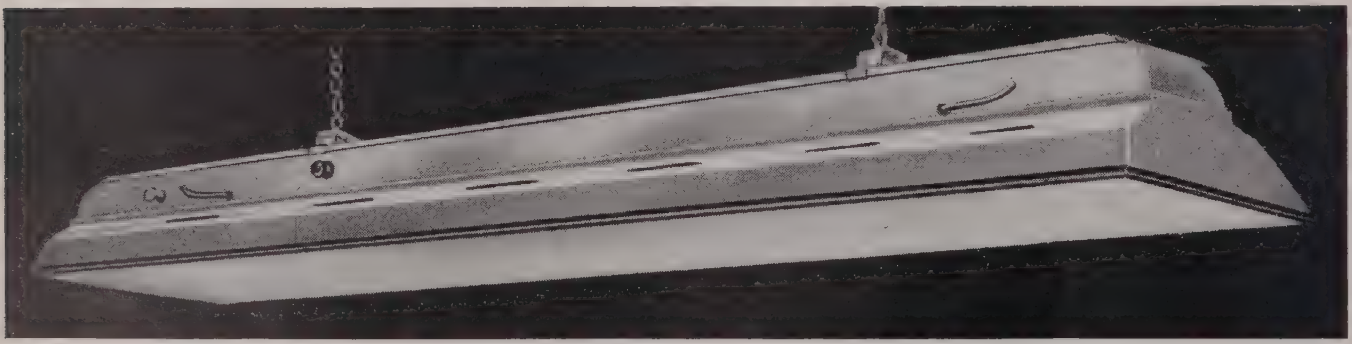

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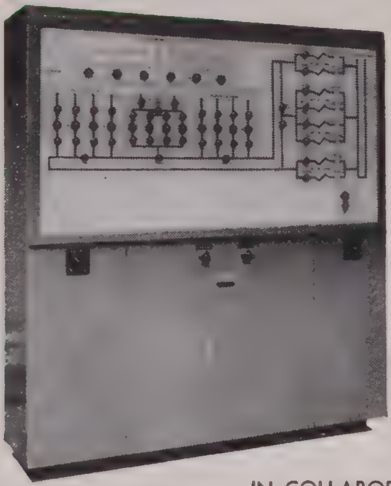

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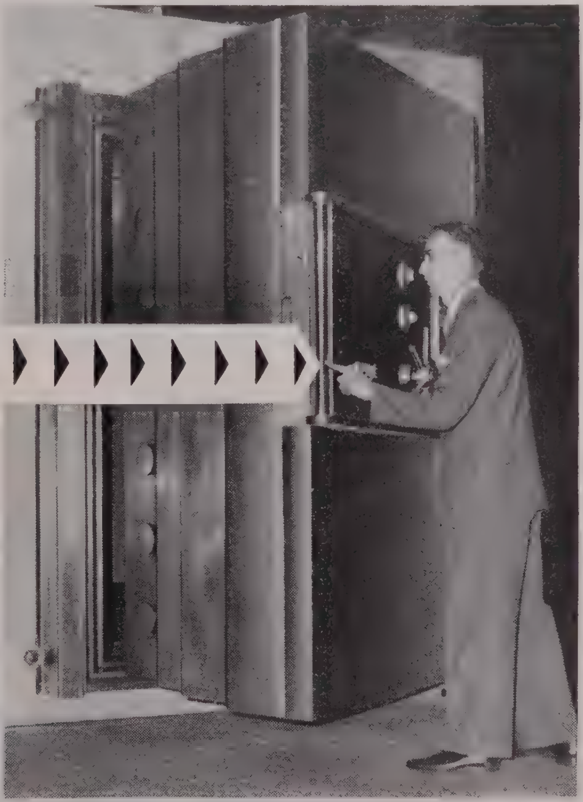
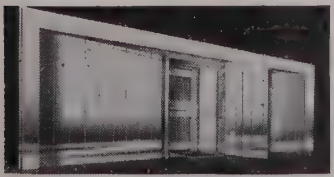
At the push of a finger



At the push of a finger this massive strongroom door swings safely into position—a pressure of 6 lbs. moves 33 tons, the weight of the door.



View of strongroom with extended architrave as it will appear when installed.

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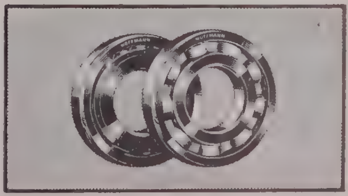

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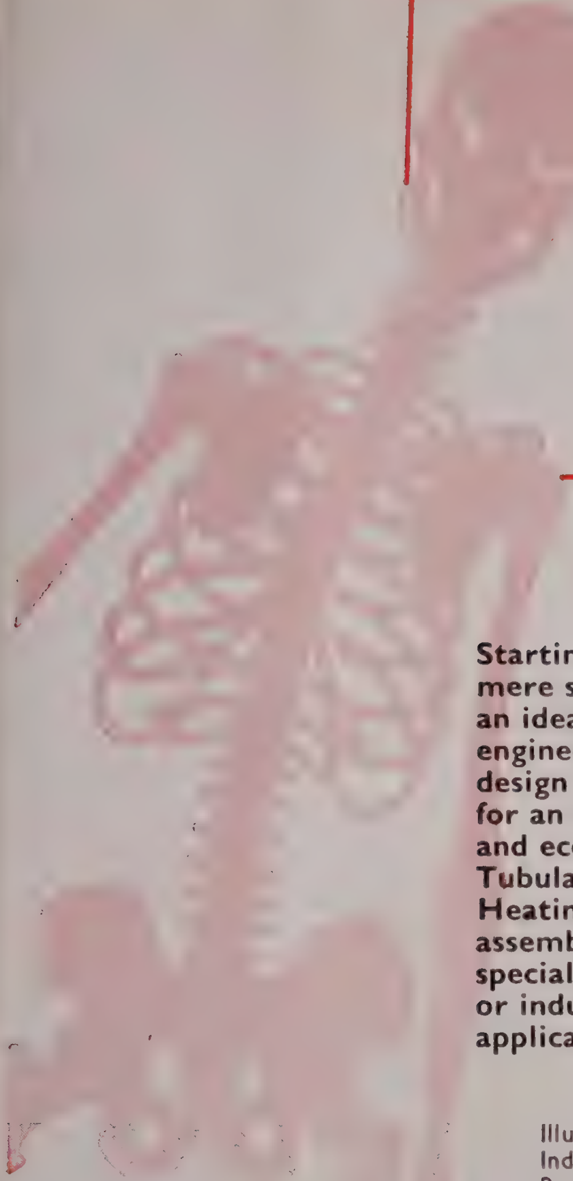

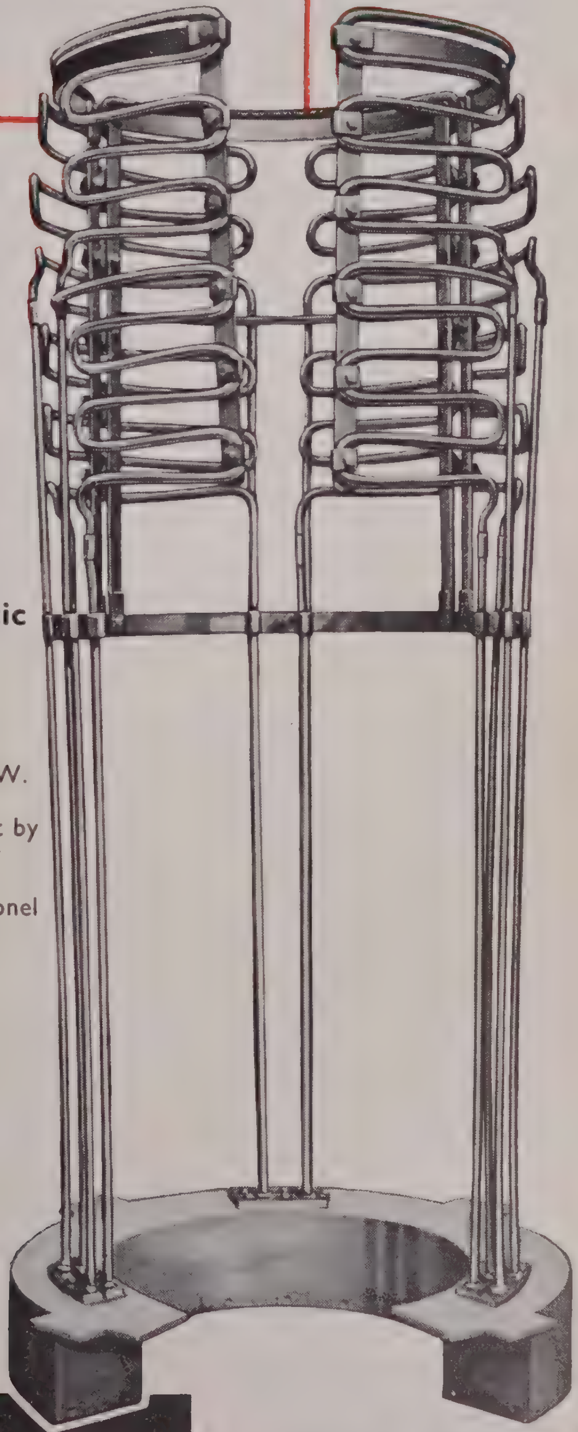

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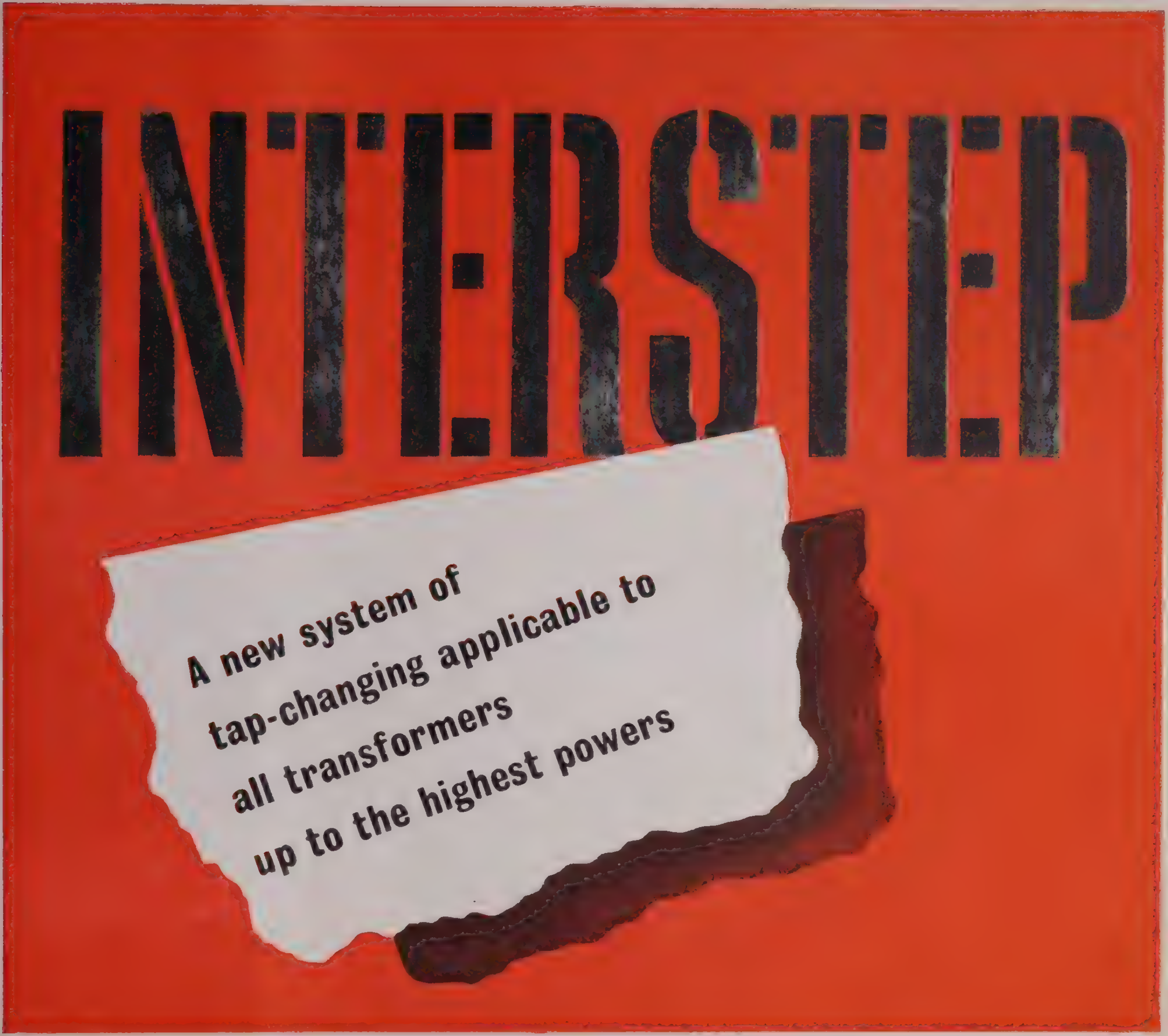

The principle is simple. A bared-wire regulator, placed successively across the taps of a tap-changing transformer, provides a smooth variation of the interstep voltage. The switching between adjacent taps is done by a pair of selector switches and through a buck-and-boost transformer which, in effect, reverses the polarity of the regulator so that it does not have to be run back at each change.

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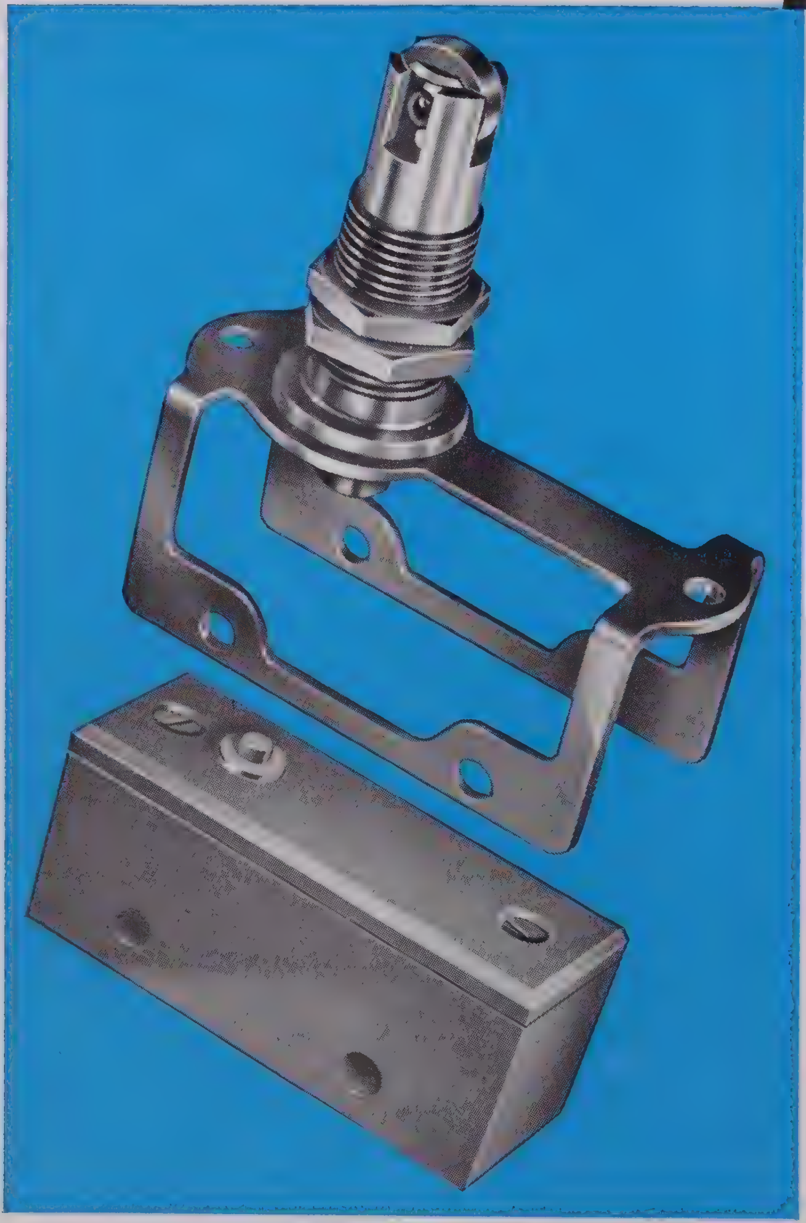

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Inductive load:	5 amps at 250 volts 50 c/s A.C.
Plunger pre-travel:	1/16th″
Over-travel:	1/16th″
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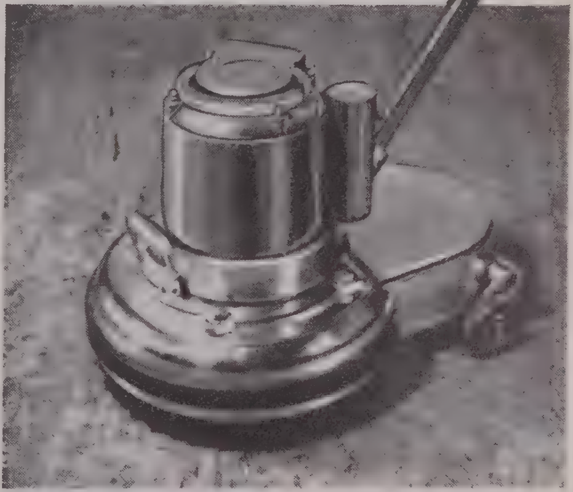

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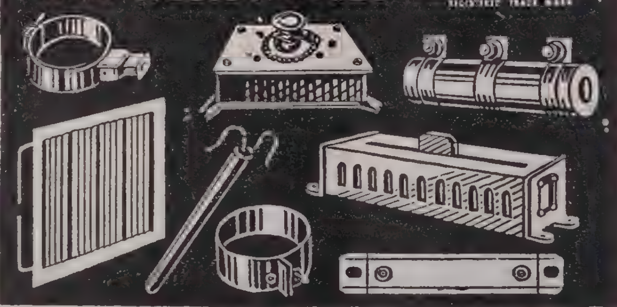

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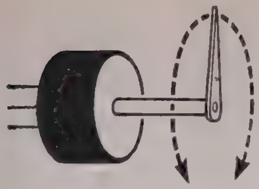
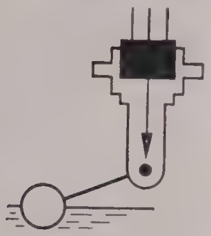
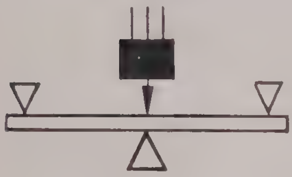


Angular Position

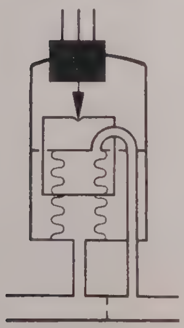


Fluid Level

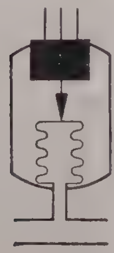


Force

Linear Position



Differential Pressure



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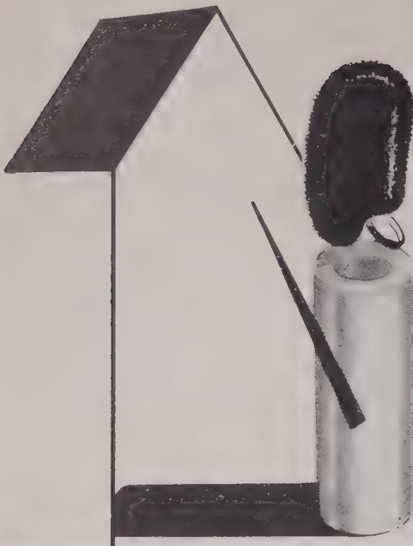

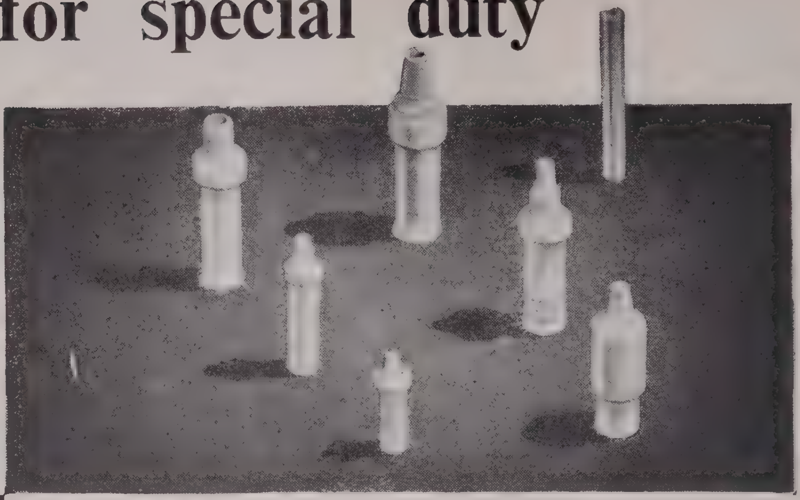

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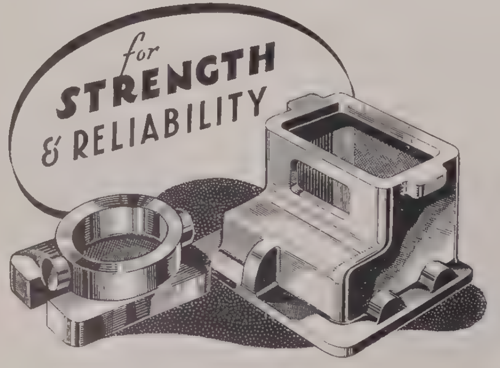

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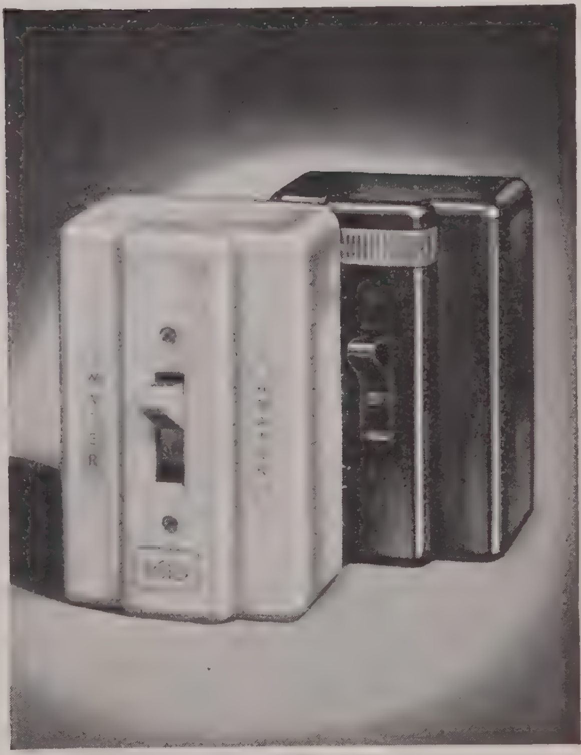

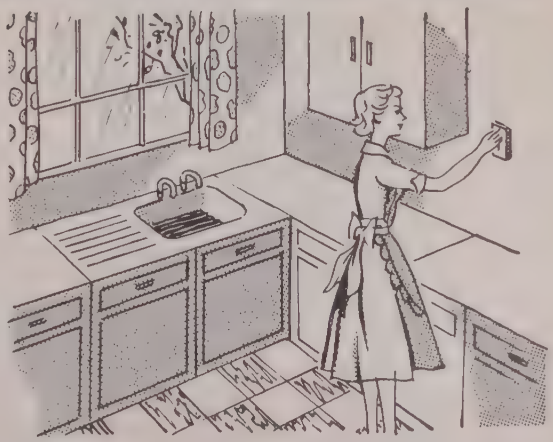

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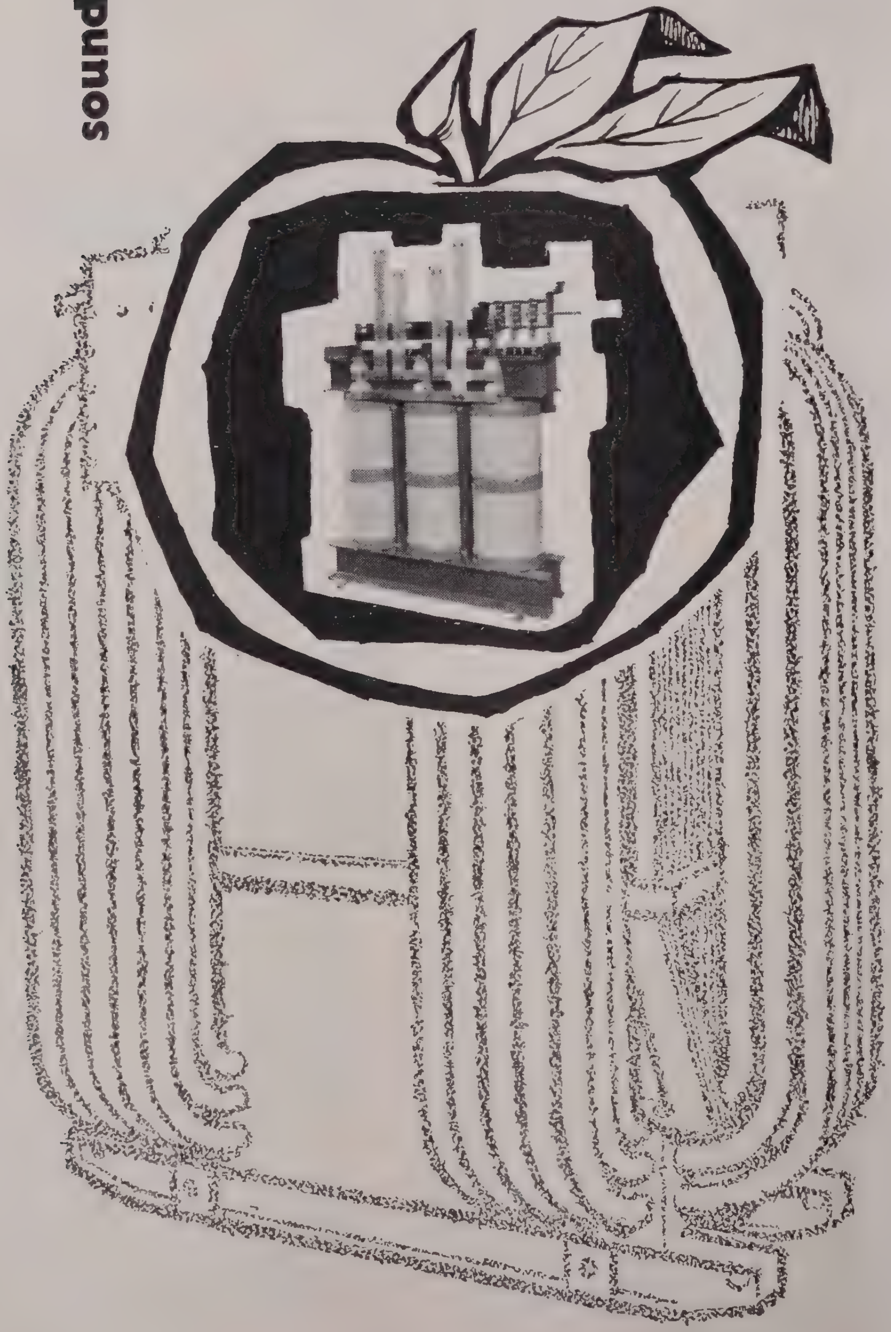

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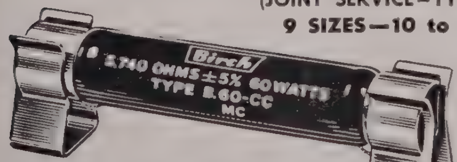

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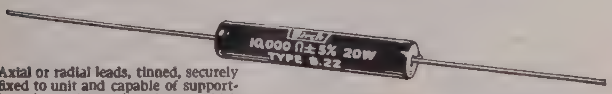

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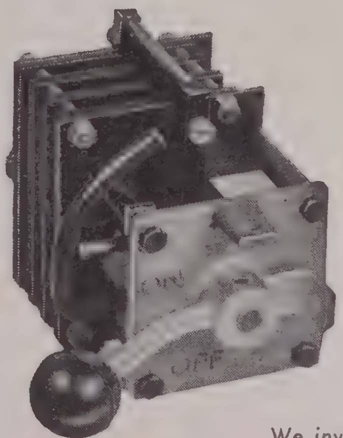

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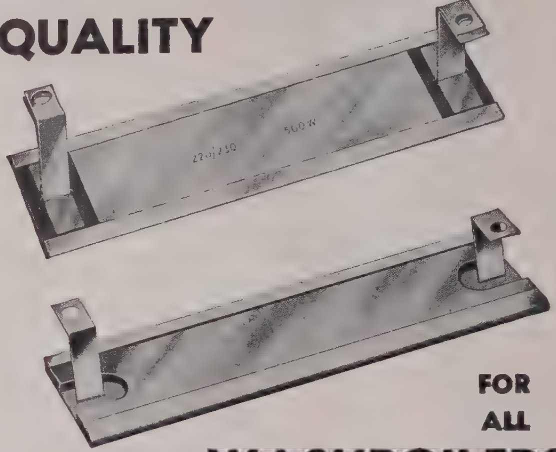

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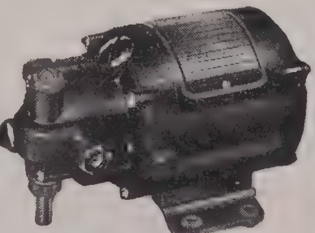

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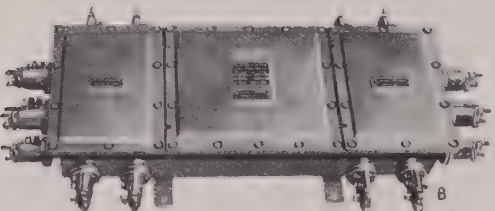

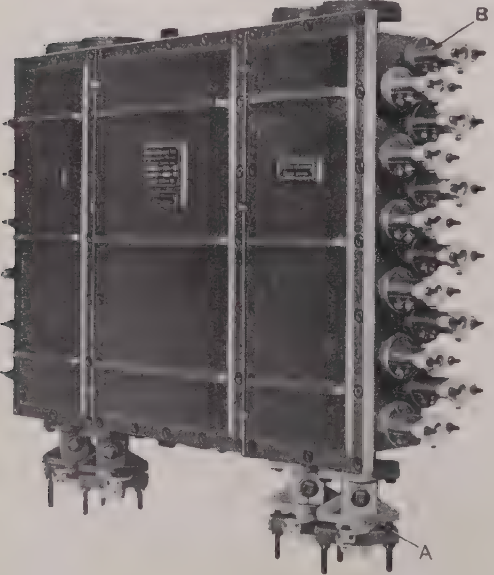

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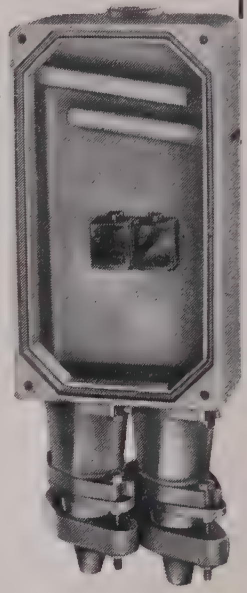

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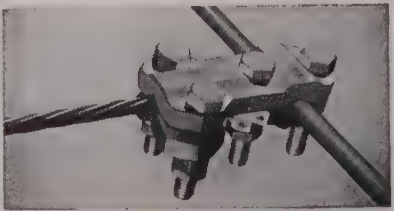

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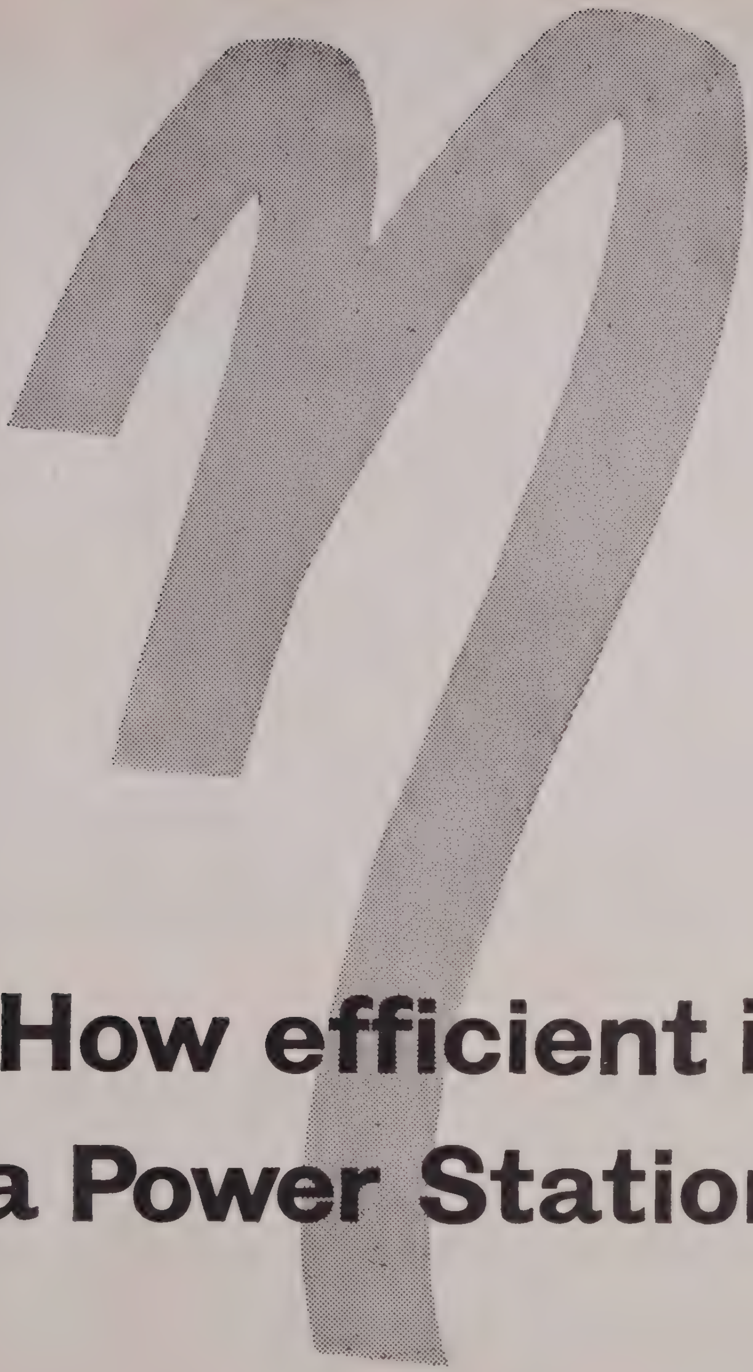

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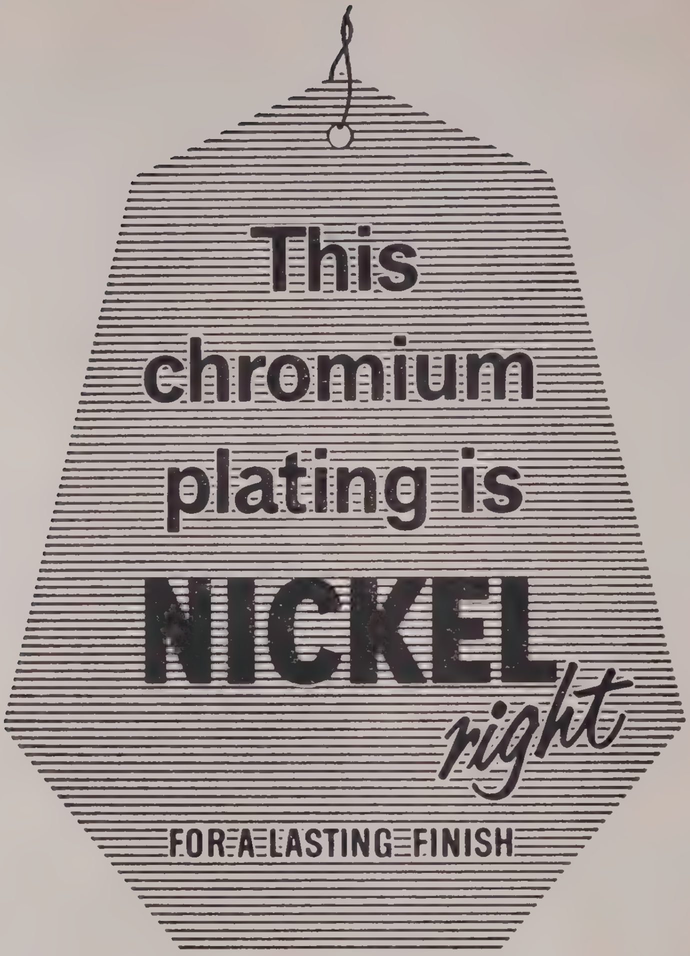

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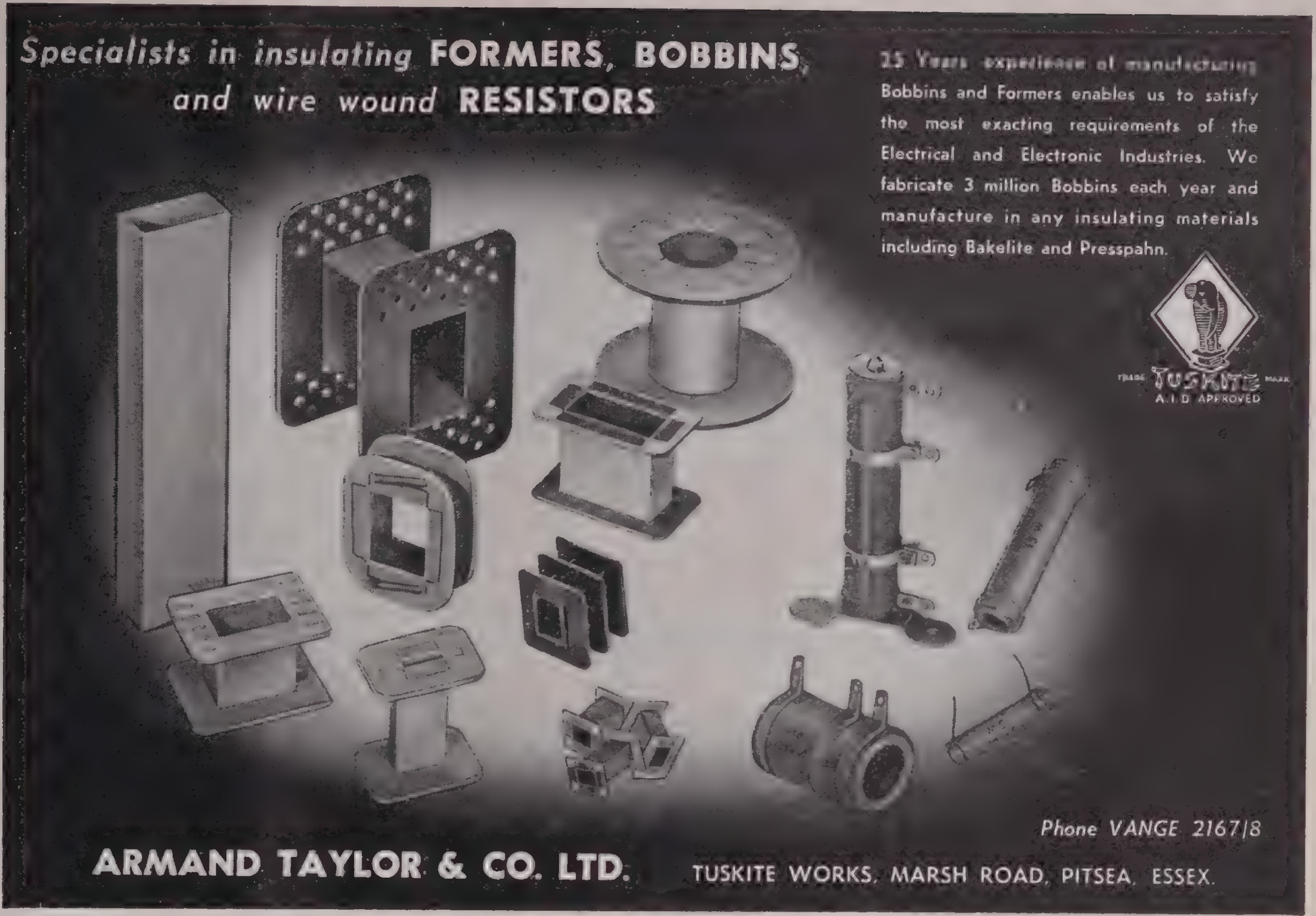

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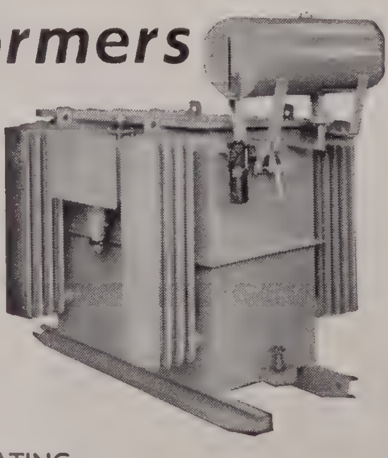

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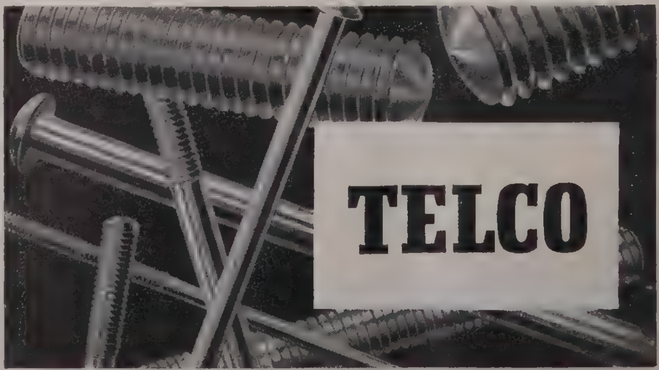

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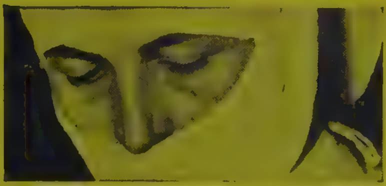

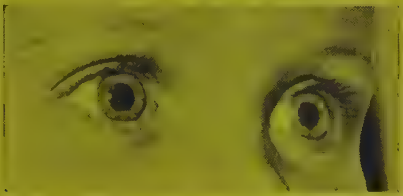

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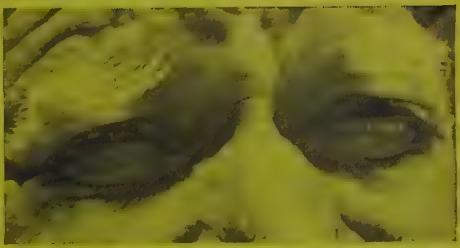

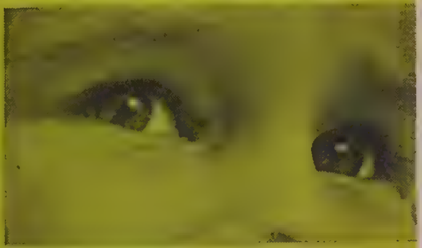

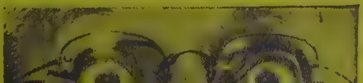

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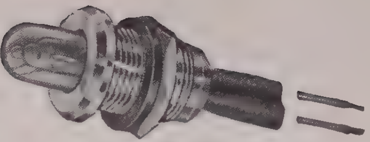
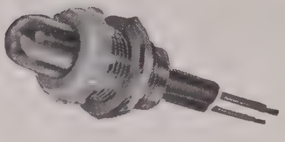

S.L.162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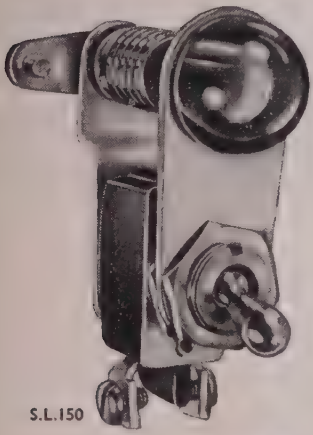
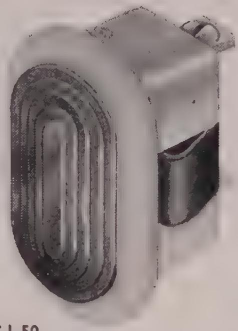

S.L.150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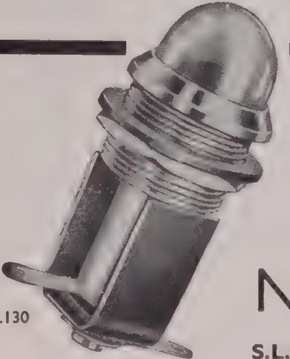
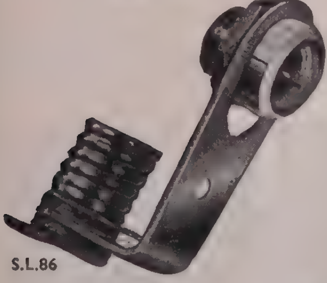

S.L.130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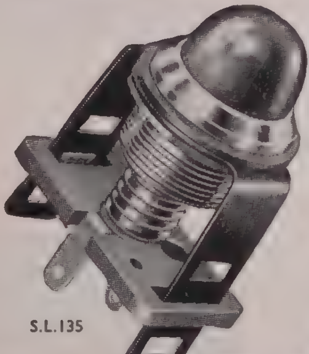
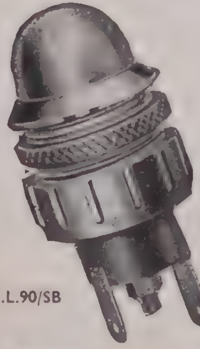
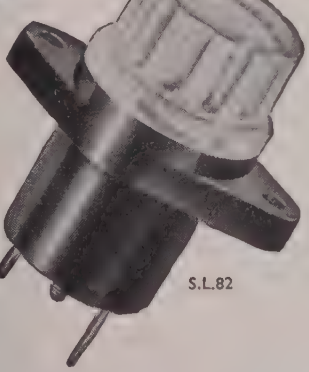
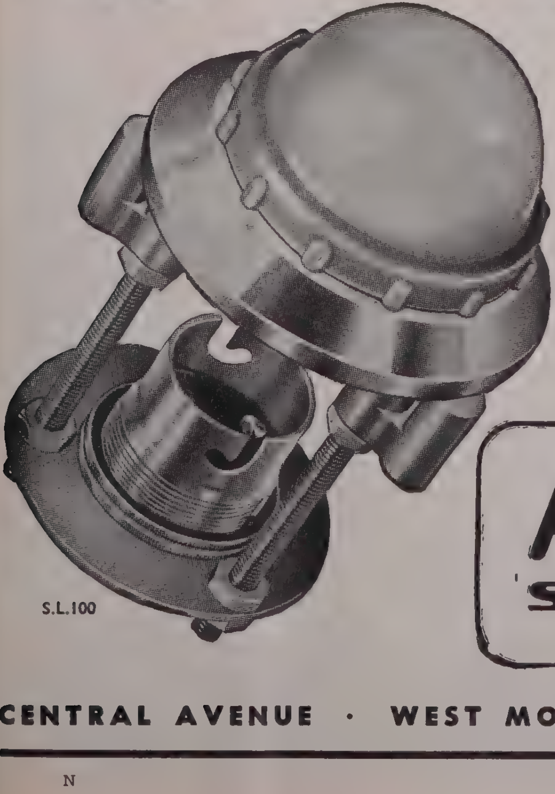

S.L.135


S.L.90/SB


S.L.82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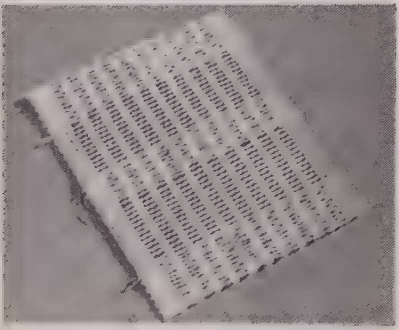

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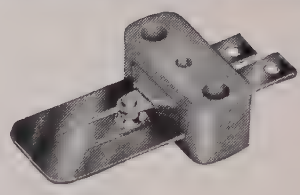

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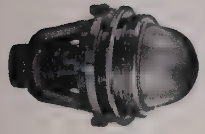

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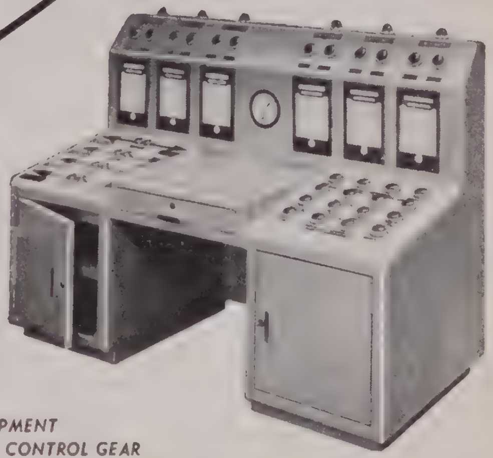

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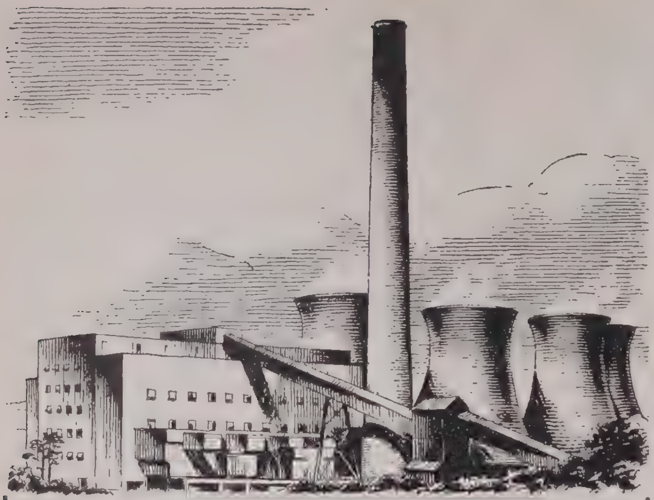

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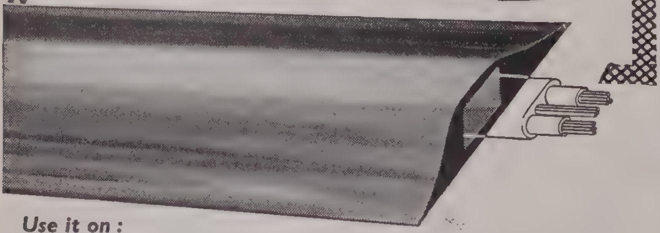

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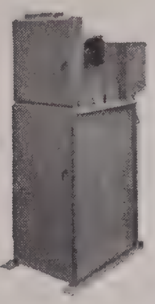

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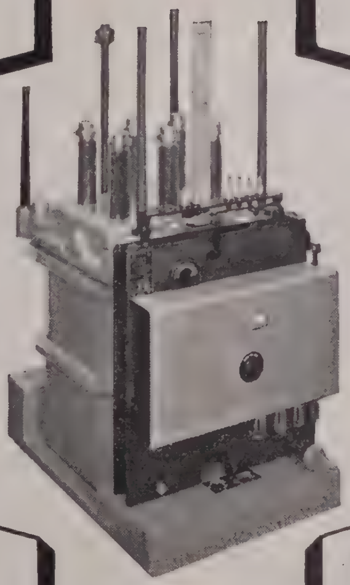

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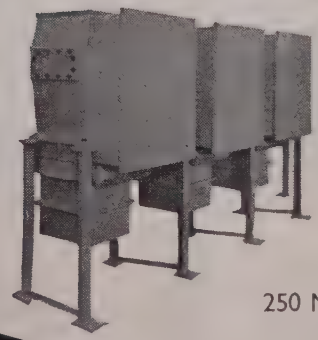

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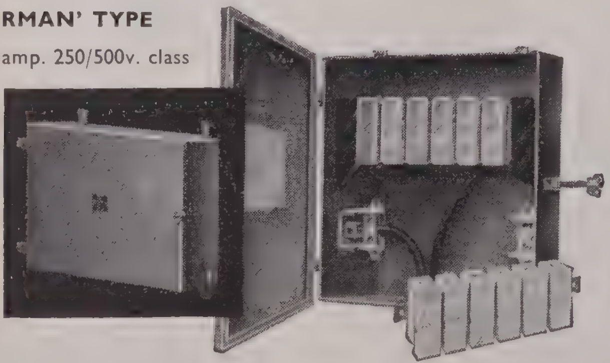

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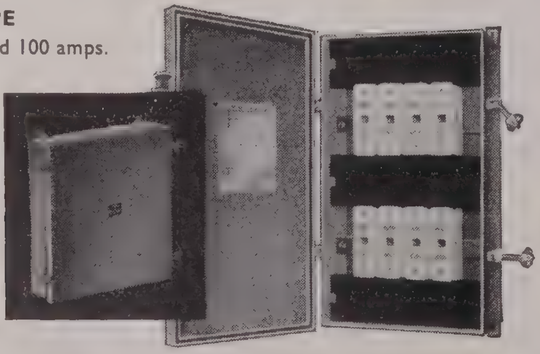

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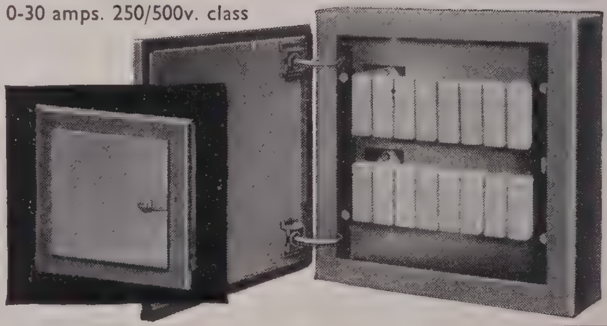

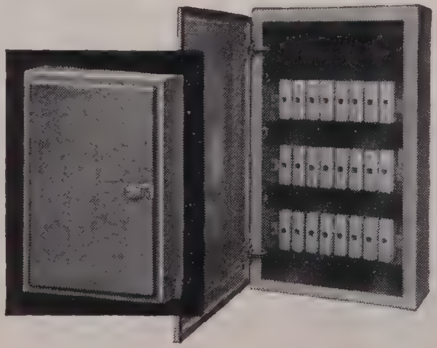

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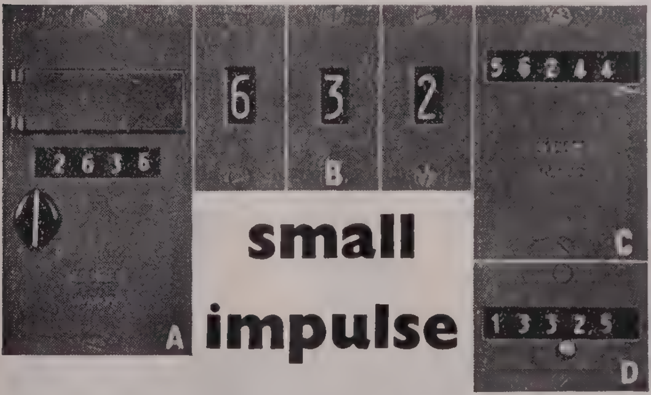

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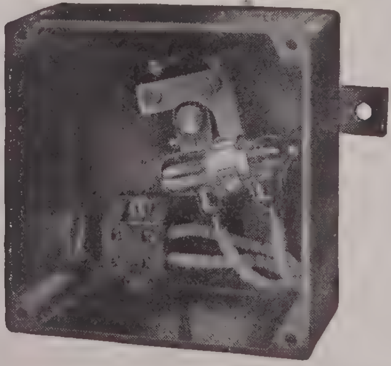

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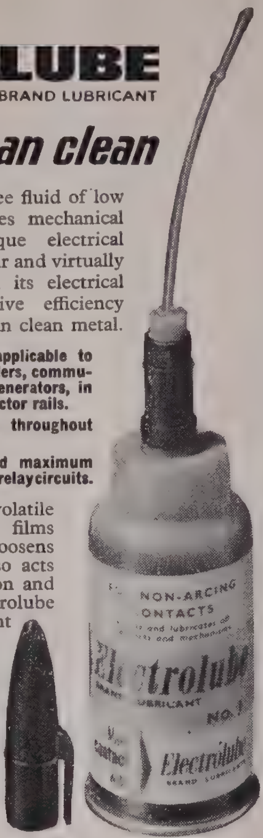

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SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

REPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. If an applicant for a situation appearing under a Box Number does not wish his reply to be forwarded to a particular firm or individual instructions to this effect should be addressed to the Advertisement Supervisor, ELECTRICAL REVIEW. The name of an advertiser using a Box Number cannot be disclosed.

Advertisements are accepted up to **first post on Monday** of the week of issue

If displayed with boxed rules, name or symbol block by **Friday** prior to week of issue

WHITSUN

Classified Advertisements for the issue of 10th June should reach us by FIRST POST on FRIDAY, 3rd JUNE, if displayed with boxed rules or blocks by THURSDAY, 2nd JUNE

All communications to be addressed to:
Classified Advertisement Department,
ELECTRICAL REVIEW
Dorset House, Stamford Street
London, S.E.1

Original testimonials should not be sent with applications for employment

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OFFICIAL NOTICES, TENDERS, ETC.

MINISTRY OF TRANSPORT

Consulting Engineers:
Stirling, Maynard & Partners

London-Edinburgh-Thurso Road A.1:
Roundabout Lighting, Stamford By-pass

TENDERS are invited for the erection and installation of steel columns and electrical equipment for 32 Group "A" Mercury Street Lighting Units, together with 2 illuminated bollards.

Form of tender, specification and bills of quantities may be obtained from the Ministry's Consulting Engineers on payment of a deposit of two guineas made payable to them, to be refunded on receipt of a bona fide tender.

Drawings and general conditions of contract may be inspected at the Consulting Engineers' offices.

Tenders in plain sealed envelopes, endorsed "Roundabout Lighting A.1," must be received by the undersigned not later than Friday, 10th June, 1960.

The Ministry does not bind itself to accept the lowest or any tender.

STIRLING, MAYNARD
& PARTNERS.
8, Station Chambers,
Peterborough. 4588

COUNTY BOROUGH OF GATESHEAD

Electrical Installation

Gateshead Technical College, Stage III

TENDERS are invited for the ELECTRICAL INSTALLATION at the above College in accordance with the Scheme and Specification.

Intending Contractors should give evidence of having recently carried out contracts of similar size.

Tender documents will be available at the end of June and completed form of tender will be returnable to me in July.

A deposit of £3, made payable to "The Borough Treasurer, Gateshead Corporation," and returnable on receipt of a bona fide tender, and/or tender documents, should be forwarded to the Borough Surveyor, Swinburne Street, Gateshead, 8, within seven days of this advertisement.

C. D. JACKSON,
Town Hall, Town Clerk.
Gateshead.
11th May, 1960. 4590

BOROUGH OF ROMFORD

Street Lighting Improvement Scheme, 1960

TENDERS are invited for the supply, erection and wiring of equipment for 62 Group "A" and 12 Group "B" Sodium Street Lighting Units in various roads in the Borough.

Specification, form of tender and bill of quantities may be obtained from the Borough Engineer and Surveyor, Town Hall, Romford, on deposit of a cheque for two guineas, which will be returned on receipt of a bona fide tender by not later than 20th June.

JOHN E. SYMONS,
Town Hall, Town Clerk.
Romford. 4637

COUNTY COUNCIL OF ESSEX

(1) Harold Wood, Redden Court County Secondary School, Hornchurch: Renewal of Electrical Installation

(2) Ardleigh Green County Junior and Infants' Schools, Hornchurch: Renewal of Electrical Installations

CONTRACTORS wishing to submit firm price tenders for the above should forward their names, from which panels will be chosen and the selected firms provided with tender documents.

The works consist of the renewal of electrical installations, with incidental builders' work, which are to be carried out during the summer holidays; estimated costs are:—

(1) £3,450. (2) £3,000.

Separate applications to reach the undersigned not later than 4th June, 1960.

H. CONOLLY, C.B.E., F.R.I.B.A.,
County Architect.
County Hall,
Chelmsford. 4635

CHESHAM URBAN DISTRICT COUNCIL

Street Lighting, Stage 2

TENDERS are invited for the supply and erection of 49 Steel Group "A" Lighting Columns fitted with 250-watt colour-corrected mercury vapour lanterns and 24 Steel Group "B" Lighting Columns fitted with 125-watt colour-corrected mercury vapour lanterns, with all lamps and control gear.

Specifications and bills of quantities may be obtained and conditions of contract and layout drawings inspected at the office of the Engineer and Surveyor of the Council.

Tenders in plain sealed envelopes bearing the words "Street Lighting, Stage 2," must be received by me not later than Saturday, the 11th June, 1960.

The Council do not bind themselves to accept the lowest or any tender.

W. I. NASH,
Council Offices, Clerk of the Council.
Chesham, Bucks. 4514

CLAY CROSS URBAN DISTRICT COUNCIL

TENDERS are invited for the provision and erection of 36 Group "A" Lighting Units on roads in the Urban District.

Specification, bills of quantities and form of tender may be obtained from the Surveyor, Council Offices, Clay Cross.

Tenders in plain sealed envelopes endorsed "Tender for Street Lighting" to be returned to the undersigned not later than noon on 10th June, 1960.

R. SHAKESBY,
Council Offices, Clerk of the Council.
93/5, High Street,
Clay Cross, nr. Chesterfield. 4589

INVERNESS COUNTY COUNCIL

will shortly invite tenders for the installation of Street Lighting including Trunk Road Lighting at Newtonmore and Carrbridge.

Contractors who propose to submit tenders for either scheme should apply in writing by 10th June to the County Clerk, County Buildings, Inverness.

The Council reserve the right to make a selection from the list of applicants and do not bind themselves to accept the lowest or any tender. 4639

CITY OF MANCHESTER

Davyhulme Sewage Works Extensions

TENDERS are invited for the supply, delivery and erection of 415-volt cables and auxiliary equipment for the Secondary Sludge Treatment Plant.

Tender documents returnable by 28th June, 1960, from the City Surveyor, Town Hall, Manchester, 2. 4636

SITUATIONS VACANT

See "Replies to Box Numbers" above)

REPUBLIC OF THE SUDAN

APPLICATIONS are invited from those suitably qualified to fill the post of ASSISTANT CHIEF ENGINEER (Generation) with the Central Electricity and Water Administration, Khartoum, The Sudan. Applicants should hold a University degree in Engineering and/or be Corporate Members of the Institution of Mechanical Engineers or the Institution of Electrical Engineers. They should have had considerable experience in design and construction of large diesel power stations. Duties include responsibility for preparing layouts and specifications covering complete installations, including electrical equipment. A knowledge of modern steam plant will be of considerable advantage.

Appointment will be on contract for a period of five years, the first twelve months being a probationary period. Salary offered is £S.2,500 per annum, plus a variable cost-of-living allowance which is at present £S.187 per annum. An initial outfit grant of £S.50 is payable on appointment. (£S.1 equals £1 0s. 6d)

Furnished accommodation is available at a nominal rent. Free medical treatment for official and family.

Annual leave is granted after the first period of eighteen months. Both official and family are granted free air passage.

Upon satisfactory completion of contract a bonus of 10% of basic salary earned will be paid.

Application should be made in the first instance in writing, stating age, qualifications and experience, and enclosing copies of recent testimonials, to the Appointments Section, Sudan Embassy, 3, Cleveland Row, St. James's, London, S.W.1, quoting ref. L.E. 7-4/3201.

Closing date 30th June, 1960. 4654

TRANSFORMER DESIGNER

for transformers and L.F. chokes

(a) Laminated and 'C' Core pattern up to 5 kVA.

(b) Power transformers up to 500 kVA.

Salary according to age and experience. 5-day week. Contributory pension scheme.

Apply:

WILLESDEN TRANSFORMER COMPANY LTD.
Manor Park Road, London N.W.10
(Elgar 5445) 309

Situations Vacant (continued)

SOUTHERN ELECTRICITY BOARD

Assistant Engineer (Maintenance and Operation)
Oxford District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class J, Grade 9 (£965-£1,025 per annum). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks., and returned to him, quoting Z.1208, not later than 6th June, 1960.

Assistant Engineer (Maintenance and Operation)
Aldershot District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class G, Grade 11 (£765 × £15 to £810 per annum), with N.J.B. conditions of service, but present trends indicate that the District may be reclassified to Class H with effect from 1st April, 1960 (£815 × £15 to £860 per annum).

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.1190, not later than 6th June, 1960.

Assistant Engineer (Maintenance and Operation)
Isle of Wight District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class F, Grade 9 (£815 × £15 to £860 per annum). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.1175, not later than 6th June, 1960.

Assistant Engineer (Local)

Swindon District of No. 2 (Newbury) Sub-Area, located at Cirencester. Salary N.J.B. Class F, Grade 11 (£710 × £15 to £755 per annum), with N.J.B. conditions of service, but present trends indicate that the District may be reclassified to Class G with effect from 1st April, 1960 (£765 × £15 to £810 per annum).

Applicants should have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution equipment, and possess suitable technical qualifications.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks., and returned to him, quoting Z.1168, not later than 6th June, 1960.

Senior Showroom Attendant

Aldershot District of No. 3 (Portsmouth) Sub-Area. Salary N.J.C. Grade 2 (£640 × £20 to £700 per annum). N.J.C. conditions of service.

Applicants must be capable of supervising staff and should have had experience in all showroom duties. They should have a sound knowledge of domestic and commercial apparatus, window displays, sales procedure, the application of tariffs and consumer service.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.1186, not later than 6th June, 1960.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. 4642

ELECTRICAL ENGINEER

required by

BRITISH HYDROCARBON CHEMICALS LIMITED

at their works at Grangemouth. Minimum qualifications Higher National Certificate. The salary will be in accordance with age and experience, and there is a non-contributory pension scheme in operation.

Replies, in writing, to the Administrative Officer, British Hydrocarbon Chemicals Ltd., Bo'ness Road. Grangemouth. 4612

BRITISH TRANSPORT COMMISSION

Research in Electrification

A team of Engineers and Physicists is being recruited under the Chief Electrical Engineer, British Railways' Central Staff, to conduct research into problems arising from the Modernisation Plan with particular reference to electric traction and certain long-term aspects of signalling and communications.

Laboratory facilities will be provided in London where all the appointments will be made in the first instance. However, certain large scale facilities will be provided elsewhere on British Railways and, because the research will be carried out as far as possible in co-operation with Universities and major Electrical Manufacturers, opportunities for secondment will occur.

A number of Posts are available for Scientists interested in the following topics:

Electromagnetic Theory—as applied to both machines and communications—Control Principles, Semi-conductor Applications, Instrumentation, Surface Physics and Mathematical Analysis of Mechanical and Electrical systems.

Appointments will be made in the following grades, commencing salaries within the ranges being determined by qualification and experience.

Principal Scientific Officers – Salary range £1535 - £1815

Candidates should possess an honours degree and proven ability to lead research teams. (Reference 1)

Senior Scientific Officers – Salary range £1200 - £1315

Candidates should possess an honours degree and a record of successful post graduate research. (Reference 2)

Scientific Officers – Salary ranges £698 - £1034 and £1045 - £1150

Candidates should possess an honours degree or equivalent professional qualification. (Reference 3).

Superannuation scheme. Certain travel facilities. Medical examination. Write stating age, qualifications and experience and quoting Post Reference to Director of Establishment, British Transport Commission, **222 Marylebone Road, London, N.W.1. within 14 days.**

4571

KENT EDUCATION COMMITTEE

North-West Kent College of Technology

Electrical Engineering Department

GRADE B ASSISTANT required to teach electrical subjects of National Certificate standard, Radio and Television Servicing and Telecommunication courses. Specialised experience in Radio Servicing would be an advantage. Industrial and/or teaching experience essential.

Salary £700 × £27 10s. to £1,150 p.a.

Forms of application are obtainable from the Principal at the College, Miskin Road, Dartford, to whom they should be returned as soon as possible. 4570

AREA SALES MANAGERS

APPLICATIONS are invited for the position of Area Sales Managers particularly for the London and Home Counties.

Applicants should have had previous experience of selling Electricity Meters to Area Boards and have contacts at all levels.

There is a contributory pension scheme and a car is provided.

Applications, which will be treated with strict confidence, giving full details as to age, training, experience and salary expected to be addressed to C. R. F. Taylor, Smith Meters Limited, Rowan Road, Streatham Vale, London, S.W.16. The envelope to be endorsed "A.S.M."

4587

NO FUTURE IN YOUR PRESENT POSITION?

An open letter to ENGINEERS, TECHNICIANS & DRAUGHTSMEN

YOU have probably seen our recent advertisements recruiting men of your profession to join our Research, Development and Production teams. We have begun an expansion programme covering the new and interesting applications of control equipment which current technological advances demand.

WE still require applicants for the following pensionable positions carrying good salaries, excellent prospects and the security of working with a world renowned organisation.

CONTROL GEAR ENGINEERS
Engineers and Technicians who are already engaged in the maintenance or application of electrical control gear for use in heavy industries. Qualifications: H.N.C. or practical equivalent.

CIRCUIT ENGINEERS
We require adaptable and imaginative men with electrical training to O.N.C. standard (or its practical equivalent). Experience of our equipment would be an advantage but we are prepared to train suitable applicants.

LIFT CIRCUIT ENGINEERS
Engineers with practical experience in the Lift industry. O.N.C. or equivalent qualifications.

In addition we have attractive positions to offer the following:

DESIGN DRAUGHTSMEN, DETAIL DRAUGHTSMEN, ENGINEERING ESTIMATORS, JUNIOR STANDARDS ENGINEERS, TRAINEE CONTRACTS ENGINEER
(O.N.C. or equivalent).

If you are in a dead end job — or even if you aren't, give me a ring or drop me a line to fix an appointment. I look forward to meeting you.

D. C. BRIDLE, PERSONNEL OFFICER

DEWHURST & Partner Limited
INVERNESS ROAD, HOUNSLOW
Tel.: HOU 7791

239

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following positions within the Division:—

ASSISTANT SHIFT CHARGE ENGINEER,
COVENTRY POWER STATION
(Vacancy No. 118/60).

Applicants are required to take charge of shift operation of boiler house plant and must possess a sound technical training, a good general engineering experience, and knowledge of the control and operation of water tube boilers, ancillary plant and the efficient combustion of fuels and chain grate stokers.

Salary will be in accordance with Class G, Grade 9 (£860-£905 per annum) of the National Joint Board Agreement, plus shift enhancement.

Closing date for receipt of applications, 3rd June, 1960.

MAINTENANCE SUPERINTENDENT,
CASTLE DONINGTON POWER STATION
(Vacancy No. 114/60).

Applicants must have had considerable experience of both mechanical and electrical maintenance in a large power station of advanced design. Technical qualifications to Higher National Certificate standard or equivalent. Corporate membership of one of the senior engineering institutions an advantage.

Experience in budgetary control, maintenance planning, costing and plant records desirable.

The salary will be within Class L, Grade 4 (£1.600-£1,705 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 3rd June, 1960.

ASSISTANT MAINTENANCE ENGINEER (Mechanical),
CASTLE DONINGTON POWER STATION
(Vacancy No. 115/60).

Applicants must have had considerable experience in the mechanical maintenance of large modern power stations. Technical qualifications to Higher National Certificate standard in mechanical engineering or equivalent. Experience in costing, planning and plant records desirable.

The salary will be in accordance with Class L, Grade 6 (£1,360-£1,450 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 3rd June, 1960.

DEPUTY STATION SUPERINTENDENT,
NORTH WILFORD POWER STATION
(Vacancy No. 121/60).

Applicants should be Corporate Members of the Institution of Mechanical and/or Institution of Electrical Engineers, and have experience in a responsible position with the operation and maintenance of modern large capacity high-pressure plant employing pulverised fuel boilers.

The successful applicant should also possess sound administrative and organising ability.

The salary will be in accordance with Class K, Grade 2 (£1,725-£1,830 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 10th June, 1960.

SENIOR DRAUGHTSMAN
(Civil Engineering and Building),
TRANSMISSION DEPT.,
DIVISIONAL HEADQUARTERS
(Vacancy No. 124/60).

Applicants for this appointment should have suitable technical training and be thoroughly conversant with the design and detailing for civil and building works, including steel and R.C. structures and foundations. The work is associated with H.V. substations and generating stations.

Salary will be in accordance with Grade 4 of Schedule D of the National Joint Board Agreement and will be within the range £930-£1,030 per annum.

Closing date for receipt of applications, 10th June, 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated.

O. S. WOODS,
Divisional Controller.

18th May, 1960. 4594

EAST MIDLANDS ELECTRICITY BOARD

Senior Assistant Engineer (Planning)
Leicester Sub-Area
(Vacancy No. 66/60)

APPLICATIONS are invited from suitably qualified and experienced persons for the above position.

Salary N.J.B. Class K, Grade 4, £1,470 × £35 to £1,575 per annum.

The duties of the appointment will consist of planning, design and preparation of specifications for both underground and overhead distribution systems up to and including 33 kV, the layout of substations and the estimating and preparation of schemes for submission for approval.

Preference will be given to candidates who possess a technical qualification equivalent, at least, to the Higher National Certificate in Electrical Engineering.

Applications in writing giving details of age, experience and present position, and quoting the above vacancy number, should be forwarded to the Manager, Leicester Sub-Area, Charles Street, Leicester, within fourteen days of the date of this advertisement. 4653

THE BRITISH LIGHTING COUNCIL requires an Engineer for development work in lighting calling for imagination, personality and an ability to write technical copy and an aptitude for public speaking. Based on London, he will be expected from time to time to travel throughout the country. Degree or equivalent academic qualifications desirable.

Salary £900 to £1,300; contributory superannuation scheme.

BRITISH LIGHTING COUNCIL
Brettenham House
16-18, Lancaster Place, London, W.C.2

4600

***Situations Vacant** (continued)*

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Chilterns Sub-Area

BEDFORD DISTRICT

SECOND ASSISTANT ENGINEER
(123/60.R).

Candidates should have had a sound technical training and considerable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems including substations.

Salary N.J.B. Class G, Grade 7 (£965-£1,025).

Apply by letter to the Manager, Bedford District, Eastern Electricity Board, Prebend Street, Bedford, by 10th June, 1960.

Fens Sub-Area

THIRD ASSISTANT ENGINEERS
(Operations and Maintenance)
(127/60.N).

Vacancies exist for two Third Assistant Engineers in the Sub-Area, one based at Cambridge and one at Peterborough. The duties include the organisation of routine inspection and maintenance of all lines, plant and equipment in the two regions of the Sub-Area, and applicants should have had experience in this field. Technical education to Grad. I.E.E. standard would be an advantage.

Salary N.J.B. Class J, Grade 10 (£910-£955).

GENERAL ASSISTANT ENGINEER
(126/60.N).

A vacancy exists for an engineer of good technical education in the Construction (Preparation) Section of the Sub-Area Engineer's Dept. The duties include the survey and preparation of line schedules for 33-kV and 11-kV lines throughout the Sub-Area, and the position offers a good opportunity to gain experience in this field.

Salary N.J.B. Class J, Grade 15 (£655-£700).

For these appointments apply by letter to the Secretarial Officer, Eastern Electricity Board, Fens Sub-Area, Milton Hall, Milton, Cambridge, by 10th June, 1960.

Northmet Sub-Area

SUB-AREA HEADQUARTERS,
LONDON, N.14

GENERAL ASSISTANT ENGINEER
(Communications), Operation and
Maintenance Section (Ref. 969)
(125/60.N).

The successful applicant will be required to assist with the planning, installation and maintenance of all classes of telephone and radio communication equipment.

Salary N.J.B. Grade 14 (£960-£1,005) inclusive of London allowance.

SENIOR DRAUGHTSMAN,
Civil Engineering and Building
Section (Ref. 968)
(124/60.R).

Candidates should have had experience in the preparation of drawings and calculations for reinforced concrete for building and civil engineering work required for 33/11-kV substations and be capable of carrying out site surveys and supervising staff. Possession of the Ordinary National Certificate (Building) or equivalent qualification will be an advantage.

Salary N.J.B. Schedule D, Grade 5 (£830-£940), inclusive of London allowance.

For these appointments apply by letter to the Manager, Eastern Electricity Board, Northmet Sub-Area, Northmet House, Southgate, London, N.14, by 9th June, 1960.

HENDON DISTRICT

THIRD ASSISTANT ENGINEER
(Ref. 971) (128/60.N).

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary N.J.B. Class G, Grade 9 (£860-£905) plus London allowance.

Apply by letter to F. A. Moinet, M.I.E.E., Manager, Eastern Electricity Board, 137/139, Brent Street, Hendon, London, N.W.4, by 8th June, 1960.

4638

HOSPITAL DESIGN ENGINEERS

EXPANSION OF BUILDING PROGRAMME

NORTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD

PROFESSIONAL ENGINEERS required for the staff of the Regional Engineer, James Galloway, M.I.Mech.E., M.I.E.E., M.I.H.V.E.

The posts are permanent and pensionable and offer considerable career prospects owing to the vast expansion of the hospital building programme. Those appointed will be members of a team designing the engineering services for new hospitals, extensions, etc.; they will work under the general control of an experienced professional engineer, but they will themselves be responsible for the design and management of individual schemes. The work is complex in nature and extremely interesting and offers a challenge to the engineer who wants more than the usual run of job.

Applicants should be A.M.I.Mech.E. or A.M.I.E.E. or A.M.I.H.V.E., but graduate members of these Institutions will be accepted provided that in the case of the Institution of Heating and Ventilating Engineers they have passed Sections A and B of the Institution examination.

Salaries will be within the range of £910 to £1,600 plus £40-£50 London weighting. The minimum point of entry for Corporate Members of the major institutions is £1,160 plus £50 London weighting. A bar exists at £1,400 plus £50 beyond which it is necessary to be A.M.I.Mech.E. or A.M.I.E.E., and graduates do not proceed beyond £1,205 plus £50 until they have obtained Corporate Membership, when continuance up the scale is automatic.

It is expected that these posts will be accepted by the professional institutions as leading to Corporate Membership provided other conditions have been fulfilled. A scheme for study leave is in process of inauguration.

Apply, stating age, qualifications (with dates) and experience, with names of two referees, to the Secretary, North West Metropolitan Regional Hospital Board, 40, Eastbourne Terrace, London, W.2, quoting reference 823. Enquiries by telephone or visit by appointment to the Board's headquarters offices would be welcome.

Tel. AMBassador 8011, Ext. 330 4569

COVENTRY CORPORATION

PUBLIC LIGHTING ELECTRICIANS required to carry out new and maintenance work on all types of public lighting. Ability to control men. Driving licence essential.

Basic rate 5s. 5½d. per hour plus 3d. time worked bonus. Good conditions of service, including superannuation scheme (for men under 38 years of age). Long service bonus and personal accident schemes. Housing accommodation may be available for married men.

All employees expected to be trade union members.

Application forms from City Engineer, Council House, returnable by 3rd June, 1960.

4608

Plessey

Planning Engineer

THE Components Group of a London Engineering Company is seeking a Planning Engineer who has a considerable experience of coil-winding and small transformers associated with both Ministry and commercial contracts.

A sound basic training and at least 3 years' industrial experience in a similar capacity are essential, and a knowledge of modern techniques is desirable. The successful candidate should be capable of accepting further responsibility after a period of service with the company.

Attractive conditions of employment together with a generous commencing salary are offered.

Applications, stating age and experience, should be forwarded to:—

The Personnel Manager
THE PLESSEY CO. LTD.
Vicarage Lane
Ilford, Essex 4615

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following positions within the Division:—

GENERAL ASSISTANT ENGINEER
(Chemists)
WILLINGTON, CASTLE
DONINGTON, SPONDON AND
LEICESTER POWER STATIONS
(Vacancy No. 127/60)

Candidates must have had a sound technical training and previous laboratory experience and should preferably hold the Higher National Certificate in Chemistry, but consideration will be given to candidates studying for that qualification.

The salary will be in accordance with Schedule A of the National Joint Board Agreement and will be within the range £560-£700 per annum.

Candidates should state on their application if they have preference for any of the stations.

Closing date for receipt of applications, 10th June, 1960.

ASSISTANT SHIFT CHARGE ENGINEER
DRAKELOW "B" POWER STATION
(Vacancy No. 130/60)

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class L, Grade 8 (£1,195-£1,270 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 10th June, 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated.

O. S. WOODS,
Divisional Controller.

20th May, 1960. 4646

G.E.C.

SENIOR EDITORIAL STAFF

The Publicity Department of The General Electric Co. Ltd., at Birmingham is extending its activities and is looking for two senior editorial men (25-35 years of age).

(1) An Electrical Engineer (university degree or equivalent) with experience and ability in technical writing, capable of undertaking the preparation of copy for engineering publications and for the technical press covering all aspects of the heavy electrical industry. This position calls for a high standard of writing but does not involve responsibility for production.

(2) A Publication Editor with an engineering background, capable of preparing material for promotional and general literature. This position demands the ability to supervise literature through all stages of production and calls for appreciation of layout and typography.

Salary commensurate with experience.

Applicants are invited to reply in writing, giving salary required and details of their experience to:

THE STAFF MANAGER
THE GENERAL ELECTRIC CO. LTD.
WITTON, BIRMINGHAM 6

4597

SOUTH OF SCOTLAND ELECTRICITY BOARD

Edinburgh and Borders Area

General Assistant District Commercial Engineer Lothians District

Salary N.J.B. Schedule A, Class G, Grade 11, £765/£810 p.a.

APPLICATIONS are invited for the appointment of a GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEER in the Lothians District, based on Musselburgh, and should be submitted on the standard form not later than 13th June, 1960.

Duties will include the installation and operation of street lighting maintenance, liaison with local authority street lighting engineers and the maintenance of records. Applicants should have a knowledge of good street lighting practice and be able to carry out photometric tests. Possession of an O.N.C. or equivalent technical qualifications will be an advantage.

Conditions of service are in accordance with the National Joint Board Agreement for the Electricity Supply Industry, and the successful candidate, subject to satisfactory evidence of health, will require to become a contributor to the Board's superannuation scheme.

The successful candidate will require to reside within a reasonable distance of the District Office at Musselburgh.

C. H. A. COLLYNS,
52, Melville Street, Manager.
Edinburgh, 3.

4610

SITE ENGINEER

(Mechanical or Electrical)

required by the NATIONAL COAL BOARD in South Wales, to supervise the installation of boiler electrical and compressed air generating plants. The duties will include the administration of sites, the co-ordination between the various plant contractors and liaison with the Board's Civil Engineering Staff.

The appointment initially will be for a minimum of 2 years, but there may be continuity of work beyond the period. Applicants should be suitably qualified engineers with previous experience in the construction and erection of power station plant.

Salary according to qualifications and experience within £900-£1,400.

Write to Staff Department (X.1735/2D), N.C.B., Hobart House, London, S.W.1, for application form which should be returned by 6th June, 1960.

4564

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

Kingston Generating Station

OPERATION SUPERINTENDENT (Vacancy No. 125/60). Candidates should indicate their experience of controlling staff and knowledge of station operation; also their knowledge of test procedures and statistical controls. Evidence is required of ability to conduct experiments and prepare reports.

Salary N.J.B. Class G, Grade 5, £1,145-£1,220 per annum, including London allowance.

Applications giving age, details of experience, present position, etc., should be sent to the Station Superintendent, Kingston Power Station, Down Hall Road, Kingston-upon-Thames, Surrey, to arrive by 9th June, 1960.

W. H. DUNKLEY,
Divisional Controller.

4632

CITY OF SALISBURY (SOUTHERN RHODESIA)

Vacancy for Electrical Engineer (Distribution)

Salary Scale £1,025 × £102 10s. to £1,332 10s. × £76 17s. 6d. to £1,563 2s. 6d. × £51 5s. to £1,768 2s. 6d. per annum

APPLICATIONS are invited for the Fixed Establishment post of ELECTRICAL ENGINEER (Distribution in the Salisbury Municipal Electricity Department, on the scale £1,025 × £102 10s. to £1,332 10s. × £76 17s. 6d. to £1,563 2s. 6d. × £51 5s. to £1,768 2s. 6d. per annum. No allowances are payable.

Commencing salary is based on qualifications and experience, with a barrier at £1,563 2s. 6d. per annum, above which no engineer can rise without being a Corporate Member of the British Institution of Electrical Engineers, and £1,614 7s. 6d. per annum is the maximum entry point into the grade.

Candidates must be graduates of the British Institution of Electrical Engineers and/or hold an equivalent electrical engineering degree.

Experience in the design and planning of distribution networks and substations from L.T. 11 kV and up to and including 33 kV, the preparation of technical specifications and the compiling of investigatory reports on general distribution problems, together with general experience on mains and substation construction works on a large undertaking is essential.

The person appointed may be required to undertake standby duties on a roster of approximately one in five, for which payment at the rate of £5 5s. per week of duty will be made.

The appointment will be subject to the City Council's service and leave regulations. The successful candidate will be required to furnish to the Council a satisfactory medical certificate of fitness and to serve a probationary period of not less than six months, and if thereafter confirmed in his appointment, to join the Southern Rhodesia Local Authorities' Joint Pension and Widows' and Orphans' Fund. He must also be able to comply with the requirements of the Federal Immigration Authorities.

Candidates must submit full particulars of their qualifications, training and experience, giving details of positions held and salaries received. Age, place of birth, nationality and marital status should be stated and copies of not more than three recent testimonials may be forwarded.

Particulars of the undertaking and a summary of conditions of service, pension and leave entitlements, etc., may be obtained from Messrs. Davis & Soper Ltd., 52-54, St. Mary Axe, London, E.C.3, to whom applications must be submitted on or before 18th June, 1960.

4591

AEI

ASSOCIATED ELECTRICAL INDUSTRIES LIMITED

GRADUATES IN ELECTRICAL ENGINEERING or PHYSICS or holders of the H.N.C. in Electrical Engineering are required in a HIGH-VOLTAGE RESEARCH LABORATORY for experimental research on HIGH-VOLTAGE PROBLEMS. The work covers a wide range and includes the construction and use of impulse voltage and impulse current generators, high direct voltage generators, and electronic equipment.

Applicants should be able to carry out investigations without close supervision.

Previous works training and laboratory experience are desirable but not essential.

The appointments are permanent and pensionable; the starting salary will be in accordance with qualifications and experience.

Please write quoting reference L.15 for application form to:—

Personnel Manager
ASSOCIATED ELECTRICAL INDUSTRIES (MANCHESTER) LTD.
Trafford Park Manchester, 17

4480

***Situations Vacant** (continued)*

REPUBLIC OF THE SUDAN

APPLICATIONS are invited from those suitably qualified to fill the vacancy of ASSISTANT ENGINEER (Substations) with the Central Electricity and Water Administration, Khartoum, The Sudan. Candidates should have had a recognised engineering training and preferably be in possession of qualifications leading to Corporate Membership of the Institution of Electrical Engineers. Experience of installation and maintenance of all kinds of indoor and outdoor substation equipment on systems up to 110 kV. A knowledge of testing and commissioning of protective gear would be an advantage.

Candidates will be required to visit the Administration's supply systems and supervise the erection and maintenance of all substation plant and equipment and to train Sudanese in this particular work.

The appointment will be on contract for five years the first twelve months being a probationary period.

Salary offered is in the range £S.1,075-£S.1,675. The starting rate will be fixed according to age, qualifications and experience. A cost-of-living allowance which is at present £S.187 per annum will be paid. An initial outfit allowance of £S.50 is payable. A bonus of 10% of basic salary earned will be paid at the end of the contract.

Furnished accommodation will be provided by the Administration at a nominal rent. Free medical treatment will be provided for the official and his family.

Annual leave is granted at the rate of 82 days per annum after the first 18 months. Free air passage is provided for the official and his family.

Application should be made in the first instance in writing, giving age, qualifications and experience, together with copies of recent testimonials, to the Appointments Section, Sudan Embassy, 3, Cleveland Row, St. James's, London, S.W.1.

Closing date, 30th June, 1960. 4655

SOUTH EASTERN ELECTRICITY BOARD

DISTRICT SENIOR COMMERCIAL ASSISTANT (Sales), Sutton District.

Salary £980 × £25 to £1,055 per annum plus London weighting under N.J.C. Grade 6. Superannuable.

The successful applicant will be responsible for the co-ordination of the 7 showrooms in the district, stocking of major appliances, sales promotion, the control of outside representatives and demonstrators, the direction of sales campaigns, exhibitions and publicity and other general commercial duties.

Applications quoting ER and naming two referees, must be made on forms from District Manager, SEEBOARD, 52, High Street, Sutton, Surrey, by 8th June, 1960.

ASSISTANT DISTRICT ENGINEERS, Dorking and Epsom District.

Salary £815 × £15 to £860 per annum, under N.J.B. Class F, Grade 9. Superannuable. Applicants should be suitably qualified and have had training and experience in construction, operation and maintenance of underground and overhead distribution systems up to 11 kV. The position will entail standby duties. Consideration will be given to a car allowance. Suitable accommodation may be available.

Applications quoting ER and naming two referees, must be made on forms from District Manager, SEEBOARD, 56, South Street, Dorking, by 8th June, 1960.

DISTRICT COMMERCIAL ASSISTANT, Eastbourne District.

Salary £640 × £20 to £700 per annum under N.J.C. Agreement, Grade 2. Superannuable. Applicants should be able to deal with consumers' enquiries and to give advice on supply matters, tariffs, appliances and electrical installations for all classes of domestic and commercial installations. Thorough knowledge of electrical appliances and the ability to quote for small contracting work is necessary.

Applications quoting ER and naming two referees, to District Manager, SEEBOARD, Electric House, Grove Road, Eastbourne, by 8th June, 1960.

GEORGE WRAY,
Secretary.

4643

MANFIELD
ENGINEERING DEVELOPMENT COMPANY LTD.

DEVONSHIRE ROAD, FOREST HILL, LONDON, S.E.23

THE above Company requires the following personnel on their Permanent Staff for work in their London offices.

SENIOR AND INTERMEDIATE DESIGN DRAUGHTSMEN

to H.N.C. standard or with equivalent experience, for interesting work on heavy industrial projects, including :—

POWER STATIONS.
STEELWORKS.
HARBOUR AND DOCK INSTALLATIONS.
OIL REFINERIES.
AIRFIELDS.

Excellent salaries will be paid. Bonus and pension schemes are in operation, and these positions offer excellent opportunities for the right type of man.

Apply to the above Company for an interview, giving details of qualifications and experience record.

4598

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

Croydon "B" Power Station

ASSISTANT ENGINEER (Control) (Vacancy No. 122/60).

Candidates should have had experience in the operation of modern generating plant and/or control room work and should have had technical training to O.N.C. level. Salary N.J.B. Class J, Grade 13, £895 to £950 per annum including London allowance and shift allowance.

ASSISTANT ENGINEER (Efficiency) (Vacancy No. 92A/60).

Applicants should have had experience of power station practice and should have had technical training to O.N.C. level.

Salary N.J.B. Class J, Grade 14, £750 to £795 per annum including London allowance.

Applications giving age, details of training, experience, etc., and quoting vacancy number, should be sent to the Station Superintendent, Croydon "B" Power Station, Beddington Farm Road, Croydon, Surrey, to arrive by 8th June, 1960.

W. H. DUNKLEY,
Divisional Controller.

4607

ADMIRALTY

ELECTRICAL ENGINEERS required for unestablished (non-pensionable) appointments in Admiralty Corps of Electrical Engineers in Bath and Royal Dockyards.

Candidates must be British subjects aged 25 years or over for basic grade (Assistant Electrical Engineer) posts and aged 30 years or over for main grade (Electrical Engineer) posts. Qualifications: University Honours Degree in Engineering, or equivalent, and have had at least two years' practical training, followed by at least three years' experience in responsible electrical engineering post, or such other experience as may be considered equivalent.

Salary, based on a 44-hour week: Basic grade, £870 per annum at age 25 rising to £1,350 (national rate); Main grade, £1,455 per annum rising to £1,990 (national rate). Entry into scales determined by qualifications and experience. Five-day week. Up to 25 working days' paid annual leave. Paid sick leave entitlement. Paid public holidays.

Forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting D.317/OA. 4563

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

SENIOR DRAUGHTSMAN (Electrical) (Vacancy SW/AV/59/60) required in the Electrical Department at Divisional Headquarters, Bristol.

Superannuation scheme. Salary N.J.B. Schedule D, Grade 4, £930-£1,030 or Grade 5, £790-£890 per annum, according to qualifications and experience.

The successful candidate will be required principally to prepare electrical layout drawings for outdoor grid substations, but general adaptability is considered important. Technical education to H.N.C. is desirable.

MAINTENANCE ENGINEER (Mechanical) (Vacancy SW/AV/62/60) required at Portishead "B" Power Station.

Superannuation scheme. Salary N.J.B. Class K, Grade 5, £1,360-£1,450 per annum.

Candidates should have served an apprenticeship and have had experience with the maintenance of modern P.F. fired boilers, turbines and coal and ash handling plant. Experience of oil-fired boilers an advantage. Good organising ability essential. Preference will be given to candidates who are corporate members of the appropriate recognised professional institutions or who hold equivalent qualifications.

GENERAL ASSISTANT ENGINEER (Operation) (Vacancy SW/AV/63/60) required at Portishead "B" Power Station, near Bristol.

Superannuation scheme. Salary N.J.B. Class K, Grade 13, £815-£860 per annum, plus £90 shift allowance.

Preference will be given to candidates who hold or are at present studying for a Higher National Certificate or similar qualification.

Previous applicants need not re-apply.

Applications on form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 4th June, 1960. Please quote appropriate vacancy number. 4593

HEATING ENGINEER

for leading manufacturers of electric floor warming system. Grad. I.H.V.E. minimum standard of qualification with experience in heat loss and design calculations. Scope and prospects in expanding organisation for individual with initiative and having electrical bias.

Full details stating salary required to Box 4660.

AEI

ASSOCIATED ELECTRICAL INDUSTRIES LIMITED

EDITORIAL ASSISTANT

ASSOCIATED ELECTRICAL INDUSTRIES LTD. have a vacancy at Trafford Park for an Editorial Assistant. This appointment offers an opportunity to work in close contact with engineers and scientists concerned with the foremost electrical engineering projects in the world.

Duties will include the editing and preparation of technical sales literature, instruction books, etc., and demand the ability to write clearly and concisely on an interesting variety of electrical engineering subjects.

Technical background and editorial experience preferred, but consideration will be given to suitable applicants wishing to enter this field.

Write fully, please, to :—

The Publicity Manager
ASSOCIATED ELECTRICAL INDUSTRIES (MANCHESTER) LTD.
Trafford Park, Manchester, 17

4605

CENTRAL ELECTRICITY GENERATING BOARD

Northern Project Group

APPLICATIONS are invited for the following vacancy, based in the first instance at TRAWSFYNYDD NUCLEAR POWER STATION SITE, NORTH WALES.

SECOND ASSISTANT ENGINEER
(Programmes and Progress)

Applicants should be familiar with the problems relating to the planning and progressing of power station construction and have sufficient knowledge of the detailed construction and erection of power station plant to enable them to assess and report upon the progress of plant erection at site.

Membership or qualifications leading to membership of an appropriate professional institution will be an advantage.

Salary within range £1,195 × £50 to £1,545 per annum. National Joint Board conditions of service. Superannuation scheme. The Board may assist in obtaining accommodation if necessary.

Application forms available from the Administrative Officer, Northern Project Group, Central Electricity Generating Board, Agecroft Road, Pendlebury, Swinton, Manchester, to be returned by 31st May, 1960. Envelopes marked "Confidential—Vacancy." 4561

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

South Caledonia Area

Commercial Assistant (Agriculture)

APPLICATIONS are invited for the above-mentioned situation. The successful applicant will be principally engaged in advisory work in connection with the application of electricity to agricultural and horticultural interests throughout the South Caledonia area (i.e., Perthshire, Argyllshire, etc.).

Applicants should possess a good working knowledge of mechanisation and electrification as applied to the agricultural industry.

A degree or diploma in agriculture, membership of Institute of Agricultural Engineers, or previous agricultural advisory experience will be considered an advantage.

Salary and conditions of employment in accordance with the National Joint Council Agreement for the Electricity Supply Industry. Salary N.J.C. Grade 4/5 (£795 × £25 to £870 or £885 × £25 to £960) according to experience and qualifications.

Superannuation scheme applicable.

Applications should be made not later than 11th June, 1960, on forms to be obtained from the Area Manager, Blackfriars, Perth. 4585

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointments :—

FOURTH ASSISTANT ENGINEERS,
System Operation Department,
Thames North Grid Control,
Redbourn, Nr. St. Albans, Herts.

Salary N.J.B. Class AX/EX, within the range of Grade 7/8, £735 × £25 to £965/£1,065 per annum.

The commencing salaries will be within the above range at a point commensurate with qualifications and experience.

Applicants should have qualifications to Higher National Certificate standard and should be prepared ultimately to undertake shift duties in the Area Grid Control Room. Some steam generating station experience is desirable.

Forms of application (AE.6/ACT) may be obtained from any Divisional Office of the Board, and should be addressed to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 4th June, 1960, quoting Staff Vacancy No. 1207. 4584

MANCHESTER REGIONAL HOSPITAL BOARD

Architectural, Surveying and Engineering Staff

A SUBSTANTIAL expansion of the hospital capital building programme offers valuable opportunities to ambitious Architects, Surveyors and Engineers. Vacancies exist in the following posts :—

(a) ASSISTANT REGIONAL ARCHITECT, £1,825/£2,175 a year.
(b) PRINCIPAL ASSISTANT ARCHITECTS (Scale II), £1,655/£2,035 a year.
(c) SENIOR ASSISTANT ARCHITECTS, SENIOR ASSISTANT QUANTITY SURVEYORS, £1,300/£1,600 a year.
(d) ASSISTANT ARCHITECTS, ASSISTANT SURVEYORS (Land and Quantity), £905/£1,310 a year.
(e) ARCHITECTURAL ASSISTANTS, SURVEYING ASSISTANTS (Land and Quantity), £625/£900 a year.
(f) ARCHITECTURAL DRAUGHTSMEN £475/£685 a year.
(g) ENGINEERS (Electrical, Mechanical and Heating and Ventilating), £910/£1,600 a year.
(h) ENGINEERING ASSISTANTS, ENGINEERING DRAUGHTSMEN, £600/£1,070 a year.

Candidates for posts under (a), (b), (c), (d) and (g) should possess full professional qualifications and for posts under (e) and (h) intermediate qualifications. Architectural Draughtsmen must have had at least three years' previous experience. All posts superannuable.

Application forms, obtainable from the Secretary, Manchester Regional Hospital Board, Cheetwood Road, Manchester, 8, should be returned by 30th June, 1960. 4566

MINISTRY OF AVIATION

TECHNICIANS required at Chessington, Surrey, and Malvern, Worcs., for the preparation of technical publications on guided weapons, radar and electronic equipment.

Qualifications: Recognised engineering apprenticeship or equivalent training in appropriate trade. Experience in one of the fields referred to above is essential. Previous experience of writing or editing technical publications an advantage. O.N.C., appropriate C. and G. Finals or equivalent desirable.

Salary £850 (age 30) to £1,065 p.a.

Application forms from Manager (P.E.1619), Professional and Executive Register, Ministry of Labour, Atlantic House, Farringdon Street, London, E.C.4. 4562

Monsanto
Regd

MONSANTO CHEMICALS LIMITED

ASSISTANT ELECTRICAL ENGINEER

MEN, aged 30 years or over, with design and practical experience of electrical installation as found in the heavy chemical and petroleum industries, are invited to apply for a post of ASSISTANT ELECTRICAL ENGINEER in the Engineering Department in London.

Minimum qualifications H.N.C. and Corporate Membership of the Institution of Electrical Engineers.

Excellent salary and career prospects; non-contributory pension scheme and other benefits.

Please send written applications giving details of age, qualifications and experience to:—

DL.140, Personnel Department
MONSANTO CHEMICALS LIMITED
Monsanto House, 10/18, Victoria Street, London, S.W.1

4631

Situations Vacant *(continued)*

NORTH WESTERN ELECTRICITY BOARD

Third Assistant Engineer, Technical Section, Engineering Department, Area Board Headquarters, Manchester, 8

THE duties will include a variety of technical investigations, and a knowledge of underground cables, overhead lines, substation equipment and protective systems will be an advantage.

Applicants should hold the H.N.C. in Electrical Engineering or equivalent.

Salary scale £925-£1,170 p.a. Class AX/EX, Grade 6. N.J.B. conditions.

Application forms to be obtained from the Secretary, North Western Electricity Board, Cheetwood Road, Manchester, 8, and returned to him by 10th June, 1960.

(a) Third Assistant District Engineer, South-West District, Altrincham.

(b) Third Assistant District Engineer, Central District, Manchester.

(c) Fourth Assistant District Engineer, South District, Cheadle.

The duties will include assisting in the supervision of the erection and maintenance of substation switchgear, laying and jointing of cables, keeping of substation records, etc.

Applicants should preferably hold H.N.C. in Electrical Engineering and should have had practical experience in substation work, operation, cable laying and jointing, etc. Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary scale:—

Post (a) £965 × £20 to £1,025 p.a. Grade J.9.

Post (b) £910 × £15 to £955 p.a. Grade H.9.

Post (c) £765 × £15 to £810 p.a. Grade G.11.

N.J.B. conditions.

Application forms to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, North Western Electricity Board, Town Hall, Manchester, 2, and returned to him by 10th June, 1960. 4640

THE UNIVERSITY OF LEEDS

Department of Electrical Engineering

APPLICATIONS are invited for appointment as LECTURER in the Department of Electrical Engineering. Candidates should have good academic qualifications and industrial or other experience in electric power engineering, electrical machines, electrical measurements, or control engineering.

Salary on the scale £1,050 × £50 to £1,400 × £75 to £1,850 (efficiency bar probably at £1,550) a year, according to age, qualifications and experience.

Applications (three copies), together with the names of three referees, should reach the Registrar, The University, Leeds, 2 (from whom further particulars may be obtained) not later than 27th June, 1960. 4611

THE GENERAL ELECTRIC COMPANY LIMITED

OPERATIONS ENGINEERS

SENIOR staff experienced in modern power plant are required for turbine operation and maintenance services at home and abroad.

We are looking for qualified engineers with an analytical approach who are capable of independent decisions on problems concerned with the running of power plant of any capacity.

These positions offer opportunity for men who wish to progress by their own efforts.

Please apply in writing, giving full details, to Personnel Manager (JVG), The General Electric Company Limited, Erith, Kent.

4595

NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

Area Board Headquarters

THIRD ASSISTANT ENGINEER, Technical Section, Chief Engineer's Department, Newcastle-upon-Tyne.

Applicants should preferably be Corporate Members of I.E.E. and should have had experience in testing, commissioning and maintenance of electrical measuring instruments and protective equipment. A knowledge of design of electronic devices and circuits an advantage.

Salary Schedule B, Grade 6, £925/£1,140. N.J.B. conditions of service.

Wear Sub-Area

SENIOR DRAUGHTSMAN at Sub-Area Headquarters, Sunderland.

Considerable experience of drawing office work, preferably in association with electricity supply industry, is required. Applicants should possess a good general and technical education and be competent to carry out site surveys, prepare working drawings and make the necessary structural calculations for building and reinforced concrete work for buildings usually associated with the industry. Architectural experience would be an advantage.

Salary Schedule D, Grade 4, £930/£1,030. N.J.B. conditions of service.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle-upon-Tyne, within ten days of the appearance of this advertisement. 4644

SIEMENS

have a vacancy for an

ELECTRICAL ENGINEER

FOR GERMAN - ENGLISH TRANSLATIONS

APPLICATIONS are invited from British-trained engineers with a good general education and sound technical training, preferably also with practical experience in the application of electric equipment. Good working knowledge of German is essential. The ability to write clearly and concisely will be expected of candidates.

A five-day week is worked, with generous holidays. Favourable housing conditions for permanent staff.

Apply, stating age, education, qualifications, experience and salary required to:—

SIEMENS - SCHUCKERTWERKE AKTIENGESELLSCHAFT
Personalabteilung, Erlangen, Werner-von-Siemens-Strasse 50
Germany

245

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPLICATIONS invited for the following superannuable N.J.B. appointments:—

FOURTH ASSISTANT ENGINEER,
TECHNICAL DEPARTMENT,
DIVISIONAL HEADQUARTERS
(Vacancy No. 134/ER/60).

Salary AX/DX.7, £840-£1,040 per annum, or AX/DX.8, £735-£935 per annum, according to experience.

Applicants should possess the Higher National Certificate (Electrical) or equivalent qualifications and have had experience in automatic and line transmission telephone apparatus. Knowledge of remote control, telemetering or V.H.F. radio equipment would be an advantage.

ASSISTANT SHIFT CHARGE ENGINEERS,
USKMOUTH "B" POWER STATION,
Nr. NEWPORT, MON.
(Vacancy No. 149/ER/60).

Salary K.8, £1,095-£1,170 per annum, plus 10% shift enhancement.

Experience in a modern power station essential. Appropriate engineering qualifications and a regular apprenticeship desirable.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 10th June, 1960. 4633

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

North Staffordshire Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER (Leek/Congleton District).

Duties will include assistance in the construction, operation and maintenance of H.V. and M.V. overhead and underground mains and substations, and in the planning of system reinforcement and extensions. Technical qualifications desirable. Salary £965/£1,025 per annum (N.J.B. Grade G.7).

Apply by letter, within ten days, stating age, experience, qualifications and present position to Mr. C. C. Pimble, Sub-Area Manager, Midlands Electricity Board, 234, Victoria Road, Fenton, Stoke-on-Trent.

Central Gloucestershire Sub-Area

SALES REPRESENTATIVE (Male) (Dean Forest District).

Duties will include advice to consumers on matters concerning supply, tariffs, apparatus sales, wiring and installation thereof. Salary £525/£625 per annum (N.J.C. Grade 1). A training scheme is in operation and salary is paid during training.

Apply by letter, within ten days, stating age, qualifications, experience and present salary to Mr. S. Raybould, Sub-Area Manager, Midlands Electricity Board, Eastern Avenue, Gloucester.

F. W. CATER,
Secretary. 4634

YORKSHIRE ELECTRICITY BOARD

No. 2 (Huddersfield) Sub-Area

SECOND ASSISTANT ENGINEER (Construction). Applicants should preferably be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications. Considerable experience in the design and construction of substations and overhead and underground networks in industrial, urban and rural areas is required. Experience of this kind at 33 kV and 66 kV will be an advantage.

Salary N.J.B. Class L, Grade 7, £1,270/£30/£1,360 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market Street, Huddersfield, not later than 10th June, 1960.

No. 3 (Sheffield) Sub-Area

ECCLESFIELD DISTRICT

THIRD ASSISTANT DISTRICT ENGINEER. Applicants should hold the Higher National Certificate in Electrical Engineering or equivalent, and have had experience in the work of a District engineering department.

Salary N.J.B. Class G, Grade 9, £860/£15/£905 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 10th June, 1960. 4652

SOUTH WALES ELECTRICITY BOARD

Surveyor-Draughtsman

APPLICATIONS are invited for the position of SURVEYOR-DRAUGHTSMAN in the Port Talbot District of the Swansea and West Central Area of the Board.

The salary for the position will be in accordance with Schedule D, Grade 6 (£620/£740) of the National Joint Board Agreement for the Electricity Supply Industry.

Applications stating age, present position, present salary, qualifications and experience should be addressed to G. R. T. Edwards, B.Sc., M.I.E.E., M.Am.I.E.E., Manager, Swansea and West Central Area, 29, Ystrad Road, Swansea Industrial Estate, Swansea, Glam., so as to arrive not later than Saturday, 11th June, 1960.

Envelopes should be endorsed "Surveyor-Draughtsman 94/60." 4568

LONDON ELECTRICITY BOARD

Assistant Distribution Engineer

APPLICATIONS are invited for the above position in the Board's Regency District at Aybrook Street, London, W.1.

Applicants should have a sound technical education to the standard of the Higher National Certificate and possess practical experience of all branches of engineering work associated with the organisation of a District distribution department.

The post is graded under Schedule A of the National Joint Board Agreement as Class J, Grade 9, £1,015 per annum, rising to £1,075 per annum, inclusive of London allowance.

Application form obtainable from the Personnel Officer, 46, New Broad Street, London, E.C.2. Please quote ref. PER/V/2925/R.

4560

SOUTH OF SCOTLAND ELECTRICITY BOARD

Stirling Area

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER (Vacancy Ref. 37/60) required for the Bathgate District of this Area. Salary N.J.B. F.5, £1,025 × £20 to £1,085 per annum.

Superannuated post.

Applications on the standard form, obtainable from the undersigned, to be returned not later than 6th June, 1960.

JAMES. G. CURTIS,
Manager.

Woodlands,
St. Ninians Road,
Stirling. 4657

TECHNICAL ASSISTANT

required by

LEADING SOUTH STAFFORDSHIRE STEELWORKS

Minimum qualification H.N.C. Experience required in A.C. and D.C. control and distribution gear, lighting, cabling and preparation of specifications.

This appointment is a senior position with a good commencing salary and the successful applicant will be responsible for electrical improvements, development and drawing and engineering office management.

Applications stating age, experience and salary required to Box 4658 by 18th June, 1960.

DRAUGHTSMEN

UNITED KINGDOM ATOMIC ENERGY AUTHORITY

The RESEARCH GROUP invites applications for a number of appointments carrying good career prospects in its DRAWING OFFICES.

(a) Atomic Energy Research Establishment, HARWELL, BERKS for LEADING DRAUGHTSMEN and DRAUGHTSMEN

(b) Atomic Energy Authority, Engineering Unit, BRACKNELL, BERKS for DRAUGHTSMEN

for a wide range of interesting mechanical and electrical work on controlled thermonuclear reactions, the proton synchrotron (NIMROD) and engineering of a more general nature.

Send POSTCARD for full details including SALARY, HOUSING and PENSION to the

Group Recruitment Officer (1681/48),
A.E.R.E., Harwell, Didcot, Berks.

4614

LEADING DRAUGHTSMEN

J. & P.

METHODS ENGINEER

It is intended to review the methods of manufacture in the Switchgear Department. A Methods Engineer responsible to the Production Manager is required for this work and he will have considerable scope for original thinking. Experience in switchgear manufacture desirable though not essential. Age group 30-40. State age, training, experience and salary required. There is a contributory pension scheme.

Applications in confidence to: Works Director, Johnson & Phillips Ltd., Charlton, London, S.E.7.

4573

UNITED KINGDOM ATOMIC ENERGY AUTHORITY

require an

ASSISTANT POWER SUPERVISOR

AT CHAPELCROSS NUCLEAR POWER STATION, Nr. ANNAN, DUMFRIESSHIRE

to assist the Power Plant Supervisor on shift work in the operation of electrical and mechanical power plant comprising an 11-kV, 3.3-kV and 415-v. electrical system, steam-raising heat exchangers, turbo-alternators and associated auxiliaries; the total capacity of the station is 180 MW.

Applicants must have served a recognised engineering apprenticeship. Experience in a conventional power station is desirable and possession of an O.N.C. or equivalent may be an advantage.

Salary between £925 (at age 30) and £1,105.

Contributory superannuation. Staff housing scheme.

Send POSTCARD to Personnel Manager at the above address for application form, quoting reference G.41/J.7.

Closing date 13th June, 1960.

4599

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

THIRD ASSISTANT ENGINEERS (Control) required for shift duties at the Birmingham Grid Control Centre. N.J.B. service conditions, superannuable appointments, salary within Schedule B, Grade 6, Class AX/FX, £925-£1,050, ultimately rising to £1,200 plus 10% shift allowance.

Applicants should have received a sound education and basic training, with subsequent experience in the electricity supply industry, preferably in power stations. H.N.C. or equivalent qualifications essential. Successful applicants will be required to assist the Control Engineer in all functions necessary for the proper control of a large portion of the Grid system.

Apply, quoting Vacancy No. 117/60MD, on forms AE6, which are available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, to whom they should be returned when completed not later than 8th June, 1960.

Applicants for Vacancy No. 56/60MD will be reconsidered. 4650

Situations Vacant *(continued)*

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointment in the Electrical Department:—

FOURTH ASSISTANT ENGINEER, REDBOURN, Nr. ST. ALBANS, HERTS. Salary N.J.B. Class AX/EX, within the range of Grades 7-8, £735 × £25 to £1,065 p.a.

Applicants should possess a Higher National Certificate or equivalent, and should have had experience in the maintenance of communication equipment comprising automatic telephone system, V.F. equipment, remote indication and control system, and cold cathode switching circuits.

The applicant appointed will be required to reside within a reasonable daily travelling distance of Redbourn.

Applications, quoting Reference S.V. No. 1289, stating age, qualifications, experience and present position, should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 4th June, 1960. 4672

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

FOURTH ASSISTANT ENGINEERS (Services), Canterbury District (Vacancy No. 121/60).

Candidates must possess either an Engineering Degree, the H.N.C. in Electrical Engineering or equivalent qualifications, and be interested in automatic protective gear and control gear associated with major electrical plant in generating stations and substations.

Salary Class AX/DX, Grade 8, £735/£935 per annum, with prospect of promotion to Grade 7, £840-£1,040 per annum, subject to satisfactory progress.

Applications giving age, details of experience, present position, etc., to Personnel Officer, South Eastern Division, Central Electricity Generating Board, Lower Ham Road, Kingston-upon-Thames, to arrive by 9th June, 1960.

W. H. DUNKLEY,
Divisional Controller.

4606

LONDON ELECTRICITY BOARD

Engineering Draughtsman

APPLICATIONS are invited for the above position in the Board's Surrey Suburban District at Wimbledon, London, S.W.19.

Candidates should have a good general and technical education and be in possession of the Ordinary National Certificate, be neat and capable draughtsmen, and be experienced in one or more of the following subjects: drawing office routine, electrical diagrams, layout of plant in transformer chambers, mains survey and recording of mains work.

The post is graded under Schedule D of the National Joint Board Agreement as Grade 6, £660 to £780 per annum, inclusive of London allowance.

Application form obtainable from the Personnel Officer, 46, New Broad Street, London, E.C.2. Please quote ref. PER/V/2942/R.

4572

H. CLARKE & COMPANY (Manchester) LIMITED

ELECTRICAL INSULATION MANUFACTURERS

SALES REPRESENTATIVE

required for Scotland.

The position is permanent and offers excellent opportunities for an enthusiastic man.

Knowledge of the electrical insulation industry and materials desirable although not essential.

All applications, which will be treated in strictest confidence, should give full particulars of previous experience, and should be addressed to:—

The Sales Manager
Atlas Works, Patricroft, Manchester

4411

MIDDLESEX COUNTY COUNCIL

Education Committee

WILLESDEN TECHNICAL COLLEGE
Denzil Road, Willesden, London, N.W.10

Department of Electrical Engineering

APPLICATIONS are invited for appointment as LECTURER IN RADIO TECHNOLOGY and ELECTRONICS from 1st September, 1960, or as soon as possible thereafter. Candidates should be able to teach Radio Technology and Industrial Electronics to the standard of the Higher National Certificate and I.E.E. Part III examinations. Industrial experience is essential.

Salary within the range (men) £1,408-£1,601 per annum.

Application forms (foolscap s.a.e.) from the Clerk to the Governing Body, 163, Willesden Lane, London, N.W.6, to whom completed forms should be returned within 10 days of the appearance of this advertisement.

C. E. GURR, M.Sc., Ph.D.,
Secretary to the Education Committee.

4656

JUNIOR ELECTRICAL ENGINEER

THE WELDLESS STEEL TUBE Co. Ltd., Wednesfield, wish to recruit a Junior Electrical Engineer for work embodying electrical control and other aspects of development related to plant automation.

Applicants, aged between 25 and 30, should be preferably graduates or have reached at least H.N.C. standard in electrical engineering. They should have a sound knowledge of modern automatic control gear, covering all developments in the use of electronics, and be capable of preparing schematic diagrams and following through developments from initial conception to final commissioning.

A good salary will be paid, related to the qualifications and experience of the individual appointed. Staff conditions include a life assurance and contributory superannuation scheme.

Those interested are asked to write in confidence to the Chief Engineer, The Weldless Steel Tube Co. Ltd., Wednesfield, Staffs.

4565

LONDON ELECTRICITY BOARD

Senior Draughtsman

APPLICATIONS are invited for the above position in the Board's North Western District at Hampstead, London, N.W.3.

Candidates should have had a good general and technical education, possess the Ordinary National Certificate in Building or its equivalent, and be capable of supervising engineering draughtsmen and other drawing office staff. They must be capable of preparing drawings and structural calculations for building and reinforced concrete work mainly associated with the construction of transformer chambers within new and existing buildings.

The post is graded under Schedule D of the National Joint Board Agreement as Grade 5, £830 to £940 per annum inclusive of London area allowance.

Application form obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2. Please quote ref. PER/V/2934/R. 4617

IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY

APPLICATIONS are invited for appointment as LECTURER in the Department of Electrical Engineering, with special reference to the transmission and distribution of electric power. Candidates should have a good honours degree in electrical engineering or the equivalent, and ability to participate effectively in research work in this field.

A salary of not less than £1,350 per annum in the Lecturer scale (£1,050 × £50 to £1,400 × £75 to £1,850 per annum) would be offered to a suitable candidate, with £60 per annum London allowance, F.S.S.U. benefits and family allowance.

Three copies of applications, giving details of qualifications and experience and the names of two referees, should reach Professor A. Tustin, Department of Electrical Engineering, Imperial College of Science and Technology, London, S.W.7, by 13th June, 1960. 4567

CITY OF NOTTINGHAM EDUCATION COMMITTEE

People's College of Further Education
Principal: W. W. Dixon, M.Sc., A.R.I.C.

APPLICATIONS are invited for the post of ASSISTANT GRADE B in Department of Electrical Engineering, to teach Electronics to O.N.C. standard. Ability to teach first year Radio Service work desirable. Minimum qualification Higher National Certificate in Electrical Engineering. Teaching experience essential.

Salary Burnham Technical Scale, £700 × £27 10s. to £1,150, with additions for graduate qualifications, training and industrial experience.

Further particulars and forms of application may be obtained from the undersigned and should be returned by 10th June, 1960.

W. G. JACKSON,
Director of Education.

Exchange Buildings,
Nottingham.

4609

TECHNICAL SALES ENGINEERS

required by

The English Electric Company Limited

THERE are vacancies in the home Branch Office Staff of the Company for Electrical Engineers, who will be responsible for sales and technical liaison with customers in the medium and heavy electrical engineering field.

Applicants, who should have served a recognised apprenticeship, must possess a minimum qualification of H.N.C. and preferably have had previous sales experience. Successful candidates will be required to settle on, or adjacent to, their territory.

Please write giving details of qualifications and experience to Dept. G.P.S., Marconi House, 336/7, Strand, London, W.C.2, quoting reference ER.0097E.

4596

DRAUGHTSMEN

VACANCIES exist for SENIOR, INTERMEDIATE AND JUNIOR DRAUGHTSMEN with general electrical engineering experience for work in the following fields :—

POWER RECTIFIERS AND TRANSFORMERS
VARIABLE SPEED DRIVES

Good working conditions. Canteen facilities. Pension scheme. All applications in strictest confidence, quoting ref. W.R.J., to :—

LANCASHIRE DYNAMO NEVELIN LTD.

Hurst Green, Oxted, Surrey
Phone : Oxted 3361

4485

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

ASSISTANT SHIFT CHARGE ENGINEER is required at Stourport "A" and "B" Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K.8, £1,095 - £1,170 per annum, plus 10% for shift duties.

A sound technical training and practical power station experience are required, and a knowledge of unit plant with p.f. boilers, operating at high pressure and high temperature will be an advantage. Appropriate technical qualifications desirable.

Apply, quoting Vacancy No. 123/60MD, on forms AE6, which are available from the Station Superintendent, Stourport Power Station, Severn Side, Stourport, Worcs., to whom they should be returned to arrive not later than 8th June, 1960. 4648

J. & P. CAPACITOR DEPARTMENT

JOHNSON & PHILLIPS Ltd. have a vacancy in their Capacitor Department for a YOUNG MAN holding H.N.C. Good opportunity for a progressive man to work in a modern well-equipped factory.

Excellent canteen facilities, pension scheme, etc.

Applications giving full particulars of training and experience, together with age, to—Employment Manager, Johnson & Phillips Ltd., Charlton, London, S.E.7.

4659

TECHNICAL INSTRUCTOR (ELECTRICAL)

required by KENYA GOVERNMENT Education Department. Appointment either on probation to permanent and pensionable establishment or on contract for one tour with gratuity at rate 13½% of total salary drawn. Normal tour 36/45 months. Commencing salary according to age and experience up to maximum in scale (including inducement addition) £813 rising to £1,341 a year. Outfit allowance £40 payable in certain circumstances. Free passages. Liberal leave.

Candidates, under 45 years of age, must possess C. and G. Final Certificate or O.N.C. in Electrical Engineering, and have had practical experience and preferably teaching experience. Duties will be teaching students taking C. and G. and O.N.C. courses in the Kenya Polytechnic, Nairobi.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, qualifications and experience, and quote M2A/51021/EF. 4618

CLASSIFIED ADVERTISEMENTS ARE PREPAID

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

ASSISTANT ENGINEER is required at Hams Hall "A" Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K.12, £860 to £905 per annum, plus 10% shift allowance.

Applicants should have received a sound technical training and should preferably have had experience in the control of the works supply system. Appropriate technical qualifications will be an advantage.

Apply, quoting Vacancy No. 120/60MD, on forms AE6, which are available from the Station Superintendent, Hams Hall Power Station, Lea Marston, Sutton Coldfield, Warwickshire, to whom they should be returned when completed not later than 8th June, 1960. 4649

TECHNICAL SALES REPRESENTATIVE

to cover Area Boards and special representation on capital projects. Must have good knowledge of outdoor substation requirements.

High remuneration. Car provided.

Full details, in strict confidence, to :—

The Sales Director
POWER CONNECTORS LTD.
2, Caxton Street, Westminster, S.W.1

4586

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER (Technical) required at No. 3 Sub-Area Headquarters at Chester. Salary £965/£1,025 per annum (N.J.B. K/10).

Applicants should have had experience of testing and commissioning of H.V. electrical plant and its associated protective gear. A knowledge of telecommunications, electronics and fault calculations would be an advantage. They should be in possession of suitable technical qualifications.

Appointment subject to medical examination. Pension scheme.

Applications, on forms obtainable from the Manager, No. 3 Sub-Area, Electricity House, Newgate Street, Chester, must be forwarded not later than 7th June, 1960. 4651

TRANSFORMER AND POWER CAPACITOR ENGINEERS

wanted for Sales and Contracts office. Preference given to candidates with H.N.C. or studying for this.

Apply:—
Sales Director
BRYCE ELECTRIC CONSTRUCTION CO. LTD.
Kelvin Works, Hackbridge, Surrey

4465

SOUTH WALES ELECTRICITY BOARD

Assistant Engineer

APPLICATIONS are invited for the position of ASSISTANT ENGINEER in the Pembrokeshire District (Haverfordwest) in the West Wales Area of the Board.

The salary for the position will be in accordance with Class E, Grade 11 (£650/£700) of the National Joint Board Agreement for the Electricity Supply Industry.

Applications stating age, present position, present salary, qualifications and experience should be addressed to Mr. W. E. Richardson, A.M.I.E.E., Manager, West Wales Area, South Beach Pavilion, Tenby, Pembrokeshire, so as to arrive not later than Saturday, 11th June, 1960.

Envelopes should be marked "Assistant Engineer, S.V. 52/60." 4592

GOVERNMENT OF ADEN

Electrical and Mechanical Engineer
Public Works Department

to take charge of the electrical and mechanical branches of the department, and to advise the Director of Public Works on technical matters in those spheres.

Contract appointment. Salary within range £1,232 - £2,004. Gratuity. Free passages. Furnished quarters at moderate rent. Children's allowances. Generous home leave. Candidates must be either A.M.I.Mech.E. or A.M.I.E.E., with 10 years' extensive experience in electrical and mechanical engineering.

Write Director of Recruitment, Colonial Office, London, S.W.1, giving full names, age, qualifications and experience, and quoting BCD.112/2/018/D11. 4619

HEREFORDSHIRE COUNTY COUNCIL

ASSISTANT ELECTRICAL ENGINEER required. A.P.T. Grades II (£765 to £880), III (£880 to £1,065) or Special Scale (£785 to £1,070) according to ability, experience and qualifications. Car allowance. Drawing board experience essential. Varied programme of large and small installations in schools and public buildings. Five-day week.

Superannuated post, subject to medical examination and one month's notice either side. Separation allowance to married men for limited period in certain cases (25s. per week and fare home every two months).

Hereford is situated in the beautiful Wye Valley.

Application forms from County Architect, Bath Street, Hereford, to be submitted by 15th June, 1960. 4620

SURREY COUNTY COUNCIL

APPLICATIONS invited for the following appointments:—

ASSISTANT ELECTRICAL ENGINEERS in salary range £785-£1,220 p.a., plus £45 p.a. London allowance. Commencing salary will be in accordance with qualifications and experience.

ELECTRICAL ENGINEERING ASSISTANT GRADE II (£765-£880 p.a., plus up to £40 p.a. London allowance, according to age). Must hold H.N.C. or have passed Sect. A of I.E.E. and be experienced in layout and design of electrical installation in buildings. Candidates will be appointed at the appropriate point within the scale according to age and ability.

Full details, present salary and three copy testimonials to County Architect, County Hall, Kingston-on-Thames, as soon as possible. 4641

CITY OF NOTTINGHAM

City Engineer's Department, Assistant Electrical Engineer (Salary £765-£1,065)

APPLICATIONS are invited for the above position in the City Engineer's Department, Nottingham, in Grade A.P.T. II (£765-£880 p.a.) or A.P.T. III (£880-£1,065 p.a.). Grade and starting salary will depend on qualifications and experience.

Applicants must have the ability to design electric lighting and power installations for new buildings. The work in the office is on a five-day week basis.

Applications on forms to be obtained from R. M. Finch, O.B.E., M.I.C.E., City Engineer and Surveyor, Guildhall, Nottingham, must be returned to him not later than Friday, 3rd June, 1960. 4533

Situations Vacant (continued)

BRANCH MANAGER

required by Overseas Electrical Contracting Co. for service in Middle East and surrounding territories.

Applicants, preferably aged between 30 and 40, with previous experience of a similar position in U.K., should apply in writing with full details of their careers. This is a senior appointment and only applicants with considerable experience in all aspects of contracting from enquiry to final account can be considered.

Total emoluments will be in the region of £4.000 and a company car will be provided. Quote ref. OCM2.

Box 4621

LONDON ELECTRICITY BOARD

Engineering Draughtsman

APPLICATIONS are invited for the above position in the Board's South Western District at Lavender Hill, Battersea, London, S.W.11.

Candidates should have had a good general and technical education and be in possession of the Ordinary National Certificate. They should be neat and capable draughtsmen with experience in one or more of the following: electrical plant layouts, electrical diagrams, building construction, mains survey and recording.

The post is graded under Schedule D of the National Joint Board Agreement as Grade 6, £660 to £780 per annum, inclusive of London allowance.

Application form from Personnel Officer, 46, New Broad Street, London, E.C.2. Please quote ref. PER/V/2935/R. 4645

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

ASSISTANT ENGINEER is required at Hams Hall B Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K12, £860-£905 per annum, plus 10% shift allowance.

Applicants should have received a sound technical training and should preferably have had experience in the control of the works supply system. Appropriate technical qualifications will be an advantage.

Apply quoting Vacancy No. 121/60MD, on forms AE6, which are available from the Station Superintendent, Hams Hall Power Station, Lea Marston, Sutton Coldfield, Warwicks., to whom they should be returned to arrive not later than 8th June, 1960. 4647

A FOREMAN for electric motor repair shop, experienced in A.C. and D.C. all types. Good opportunity in expanding company. New house available.—Lewis Electric Motors Ltd., Moor Works, Blackamoor Lane, Maidenhead, Berks. 4412

A. J. SMITH, Consulting Engineer, requires senior and semi-senior electrical engineer for the design and supervision of a variety of electrical installations. Four weeks holiday per year, subsidised meals, sick pay scheme and non-contributory pension. Please send full details of qualifications, training and experience, together with approximate salary required, to 19, Bolsover Street, London, W.1, marking the envelope "Confidential." 4574

A LARGE British company requires a number of refrigeration service engineers for work in Nigeria and Ghana. They must be widely experienced in the servicing of domestic refrigerators and simple industrial equipment and must be capable of controlling a workshop and supervising and training local mechanics. The initial contract will be for a period of 24 months with the possibility of renewal or transfer to the permanent management staff. Salary approximately £1,300 per annum, with free accommodation plus a gratuity on satisfactory completion of tour. Apply giving full details of age and qualifications to—Box 4523.

MORECAMBE ELECTRICAL EQUIPMENT COMPANY LIMITED

SENIOR CONTROL GEAR DESIGN ENGINEER

WE have a vacancy at Morecambe for an Engineer who is experienced in the design of components and accessories for Electric Motor Control Gear.

Experience of modern materials and manufacturing methods is essential, and the appointment carries with it the responsibility for the supervision of testing of prototype designs and completion of production drawings.

The salary would be commensurate with age and experience.

Please write with confidential details to the Technical Director.

WESTGATE WORKS, MORECAMBE, LANCASHIRE

4486

AGENT required for the London area by a firm manufacturing domestic electrical appliances. Must have live connection amongst all the wholesalers in London and the Home Counties. Apply giving full details to—Box 4580.

ASSISTANT supervisor with estimating experience required by electrical contractor. Apply in writing stating experience, salary required, etc., to—Waring, Withers & Chadwick Ltd., 40, Hatton Garden, London, E.C.1. 4575

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE Co. Ltd., Longridge House, Manchester, 4. Electrical surveyor required in Scotland. Permanent position carrying progressive salary scale £800 to £1,100 and non-contributory pension. Candidates, aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. 4629

BRYCE ELECTRIC CONSTRUCTION Co. Ltd. have vacancies for senior and junior power capacitor and transformer development engineers. Write Chief Engineer, Bryce Electric Construction Co. Ltd., Kelvin Works, Hackbridge, Surrey, stating age, experience, qualifications, and salary required. 4321

CONSULTING engineers require intermediate draughtsmen, designers and junior draughtsmen for electrical services in connection with hospitals, university projects and schools. Write — Locke & Beal, 303/307, Balham High Road, London, S.W.17. 4495

CONTROL circuit engineer and estimator for automatic motor control gear; O.N.C. or H.N.C. desirable with previous experience; permanent and pensionable situation. Apply giving details of age, experience and present salary, to—The Managing Director, British Klockner Switchgear Ltd., Chertsey, Surrey. 129

DRAUGHTSMAN (junior) electro/mechanical; interesting situation with excellent prospects. Apply giving full details of age, experience and present salary, to—The Managing Director, British Klockner Switchgear Ltd., Chertsey, Surrey. 130

DRAUGHTSMAN required by manufacturers of medium-voltage metalclad switchgear for their contracts drawing office. Bonus and non-contributory superannuation schemes in operation. The company is within six miles of the South Devon Coast, and a house is available for the selected applicant. Write, stating previous experience, age, and salary required, to — Ottermill Switchgear Limited, Ottery St. Mary, Devon. 4554

DRAUGHTSMAN required for consulting engineers' office, to assist in the design of lighting and power installations for all classes of buildings. Five-day week. Spring and summer holidays. Pension scheme and luncheon vouchers. Apply in writing, stating age, experience, present salary and salary required to—J. Roger Preston & Partners, 15, North Audley Street, London, W.1. 4602

EDITORIAL assistant for electrical engineering journal (London). Engineering or science degree and some engineering experience necessary. Journalistic knowledge desirable but those with literary ability would be considered. Good prospects for advancement. Pension scheme. Age approx. 25-30. Salary according quals. and exp. but commencing at approx. £850-£1,000 if within the stated age range.—Box 4661.

ELECTRICAL contractors require an estimator for industrial and commercial installations. Only fully experienced men who are conversant with all types (including FLP) need apply. Please write stating experience, qualifications and salary required to—Box 4622.

ELECTRICAL design engineer required to work with minimum supervision on interesting power and lighting schemes for major building projects. H.N.C. level of ability required. Apply in writing giving full details of age, experience and salary required to—Norman & Dawbarn, Architects & Consulting Engineers, 7, Portland Place, London, W.1. 131

ELECTRICAL draughtsman. A good opportunity is open for a man of above average capability with a firm of consulting engineers in London to undertake the preparation of design, drawings and specifications for power lighting installations covering all types of commercial and industrial buildings. Good salary offered to the right man. Write in the first instance stating age, salary and experience to—A. F. Myers & Partners, 147, Victoria Street. London, S.W.1. 4576

ELECTRICAL engineer required for consulting engineers' office, to carry out the design of lighting and power installations for all classes of buildings. Five-day week. Spring and summer holidays. Pension scheme and luncheon vouchers. Apply in writing, stating age, experience, present salary and salary required to—J. Roger Preston & Partners, 15, North Audley Street, London, W.1. 4603

ELECTRICAL engineer required to take charge of estimating department of large London electrical contractor. Please reply, giving full details, to—Box 4496.

ELECTRICAL engineer required for Glasgow office staff, age 23-28. Applicants (H.N.C. minimum) should have had experience in the manufacture of electrical machines. Progressive salary with non-contributory pension. Applications stating age, nationality, qualifications and experience to British Engine Boiler & Electrical Insurance Co. Ltd., 98, West George Street, Glasgow, C.2. 4630

ELECTRICIANS, first-class, good technical knowledge, experience installation work. Two years overseas, excellent situation, large electrical concern. Write age, experience, copy references.—Box 4470.

ELECTRICIANS seeking regular employment required by small expanding North London contractor. Five-day week.—Box 7538.

ELECTROSTATIC precipitation engineer for senior position, fully qualified to handle design, estimating, sales. Previous experience essential.—Box 4623.

ENFIELD-STANDARD POWER CABLES Ltd. have a vacancy for an oil engineer experienced with the installation of oil-filled cables. Applications to be addressed to the Personnel Manager, Enfield-Standard Power Cables Ltd., Millmarsh Lane, Brimsdown, Enfield, Middlesex. 4601

ENGINEER for India. Applications are invited for the position of senior engineer (works) for an established copper producer in India. Applicants must hold Corporate Membership of Mechanical or Electrical Institutions. Knowledge of copper refining and rolling with thermal power generating plant an advantage. Salary will be in accordance with qualifications and experience. Free housing, generous allowances and excellent amenities. Write in the first place with all details of birth, nationality, experience, etc., to — Box MY/146, c/o 95, Bishopsgate, London, E.C.2. 4662

EXPERIENCED sales engineer, based on a London office, required by progressive company engaged in manufacture of electrical temperature control equipment. Applications range from domestic electrical appliances to heating, ventilating and air conditioning. Salary £1,200 p.a., or higher, considered for man with especially suitable qualifications. Apply with full details to—Box 4624.

EXPERIENCED supervising and estimating electrical engineer required for electrical contractors in E.C. district of London. Progressive position. Apply stating qualifications, experience, giving indication of salary required, to—Box 4663.

H.T. and L.T. cable jointers required for work in Southern England.—Box 7543.

JUNIOR electrical engineer required to assist in the development and laboratory testing of induction watthour meters and associated test equipment. Minimum educational requirement H.N.C. (Electrical). Write giving full details of experience to the Personnel Manager, Sangamo Weston Ltd., Cambridge Road, Enfield, Middx. 4472

LONDON chartered patent agents require graduate in electrical engineering for training with a view to qualifying as a patent agent; interesting work with good prospects for a professional career. Write giving details of age, qualifications, etc., to—Box No. DA.2055, c/o Whites Ltd., 72, Fleet St., London, E.C.4. 4664

MAINTENANCE electrician for factory in South London, experienced in erection and maintenance of all electrical services, including flameproof equipment. To work under maintenance engineer. Not under 30 years.—Box 4604.

REPAIR shop motor winder, A.C. and D.C., good general knowledge of the trade also required. Excellent prospects in small, well-established business, 25 miles west of London. —Box 4577.

REPRESENTATIVE required by electrical wholesalers, London area, salary, commission, car allowance.—Box 4665.

REPRESENTATIVES required calling on wholesalers and retailers for most competitive distributors in the trade. Accessories, lamps, fittings and appliances. Only top-rate men with electrical trade connections need apply. —Universal Distributing Co. Ltd., 66/68, Great Eastern Street, London, E.C.2 (Phone, SHOreditch 8282). 4415

SALES assistants required for busy trade counter of electrical wholesalers. Only experienced or at least men with initiative need apply. Phone (London) STA. 6050, Personnel Manager, Mr. Bernard. 4581

SALES engineers. Young engineers over 21 years required for indoor staff of sales department. Technical and works training in electrical engineering practice, at least to O.N.C. standard, is required by West London engineering company specialising in explosion-proof and industrial electrical control gear as well as other electrical equipment for industry. Candidates, in replying, should state age, training, qualifications and anticipated remuneration, in confidence, to—Box 182.

SALES representative for Birmingham area for sale of trunking, lighting fittings, heating and cooking appliances, to call on retailers, works and Electricity Board showrooms. Write stating age, salary requirement and if car owner to—Box 4613.

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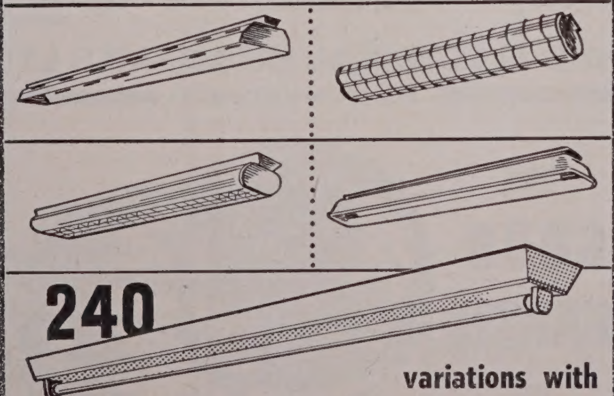

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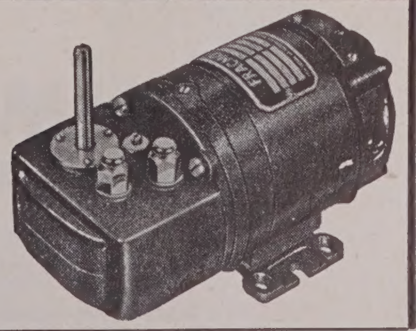

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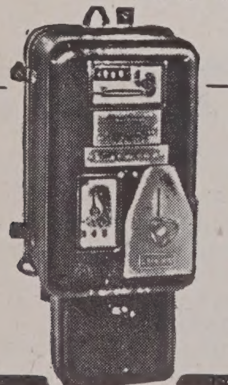

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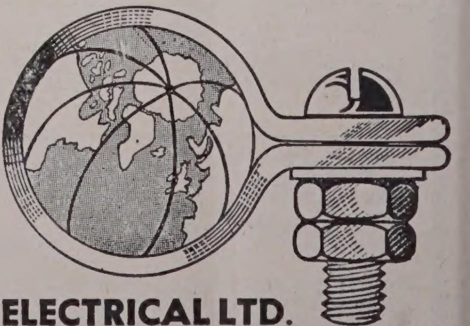

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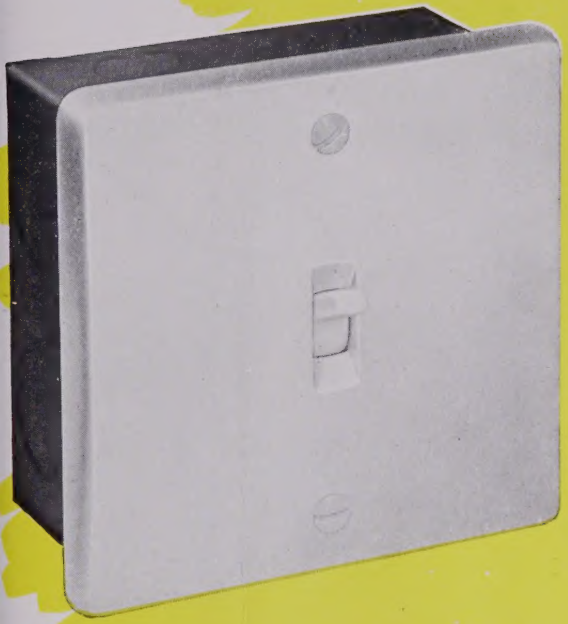

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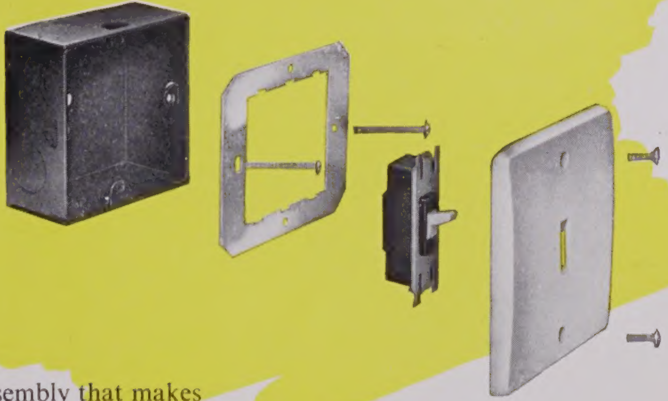

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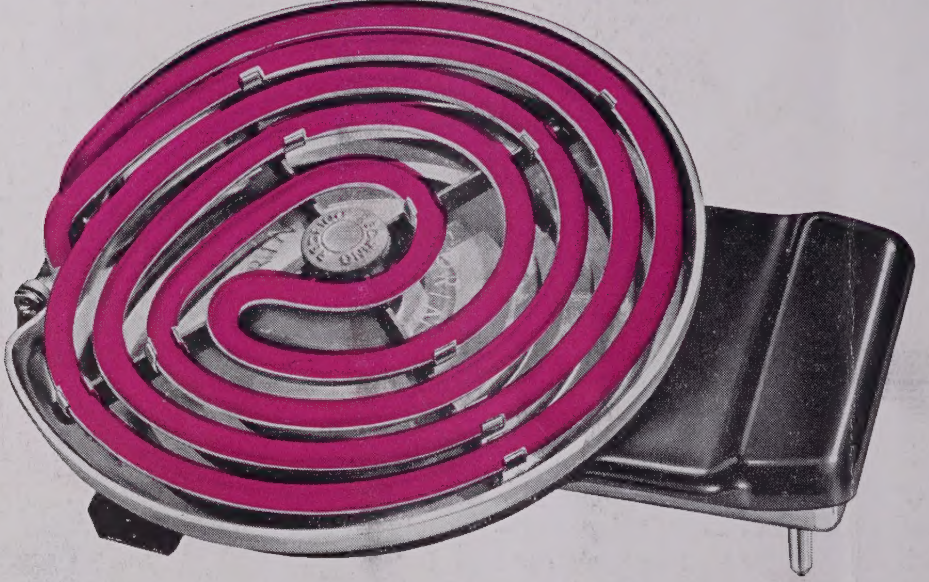

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